The British Power Conversion Company

Power Pro

CL-300P SERIES

UPS

10-15-20-30-40-60-80 kVA

3 Phase Input - 3 Phase Output

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SERVICE MANUAL

Important:

This service manual is issued for the use of BPC and Actual Power Engineers only who have undergone appropriate training.

Repair or maintenance carried out by none authorized engineers may invalidate any manufacturers warranty.

BPC EMEA Ltd or Actual Power Ltd can take no responsibility for any injury or damage that may result from the use of the information in this manual.

The CL range use very high DC and AC Voltages which can be lethal.

The specifications of the units may change and these changes may not be reflected in this manual, the user manual and schematics specific to the machine should also be consulted before attempting, installation, commissioning, maintenance or repair.

Any external cable dimensions and protection ratings mentioned in the service and user manuals are suggestions only. The absolute responsibility for the correct sizing of any external cabling and protection is that of the electrical design engineer responsible for the installation, and should be in accordance with all national and local codes taking into account the site wiring conditions.

Sufficient access should be left to the front, sides and rear of the machines to allow any future repair and maintenance to be carried out, alternatively the machines should be installed in such a manner that they can be easily moved to permit necessary access.

Battery installations should comply with all national and local codes and it is recommended that they comply with EN 50272-2:2001

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CONTENTS

SAFETY **1**

I. GENERAL DESCRIPTION **2**

1.1 Introduction 2
1.2 Design Concept 3
1.2.1 Operating modes of UPS 4
1.3 Technical specifications 8
1.4 CL300P Series UPS Basic Diagrams 9
1.5 CL300P Series UPS Electronic Boards 13
1.5.1 PCB Locations 14
1.5.2 PFC3P-R1 IGBT Rectifier Controller Board 17
1.5.3 IPMD Intelligent Power Module (IPM) Driver Board 20
1.5.4 P3MC-R5 UPS Main Controller Board 22
1.5.5 ADVS01-R1 DC-3 Phase AC Voltage Sample Board 27
1.5.6 SDXC300-R1 Bypass and Inverter SCR Driver Board 30
1.5.7 STP01-R2 Switching Power Supply Board 32
1.5.8 ITF3-R2 3Ph/3Ph UPS Interface Board 33
1.5.9 STM01 Output Monitoring Board 35
1.5.10 OPS3 3Ph Voltage and Current Sample Board 36

II. UPS INSTALLATION **45**

2.1. Introduction 45
2.2. Unpacking 45
2.3. Equipment Positioning 45
2.4. Connecting the UPS power cables 45
2.4.1 Safety Earth 46
2.4.2 Cable connection procedure 46
2.4.3 Description of connection terminals of the UPS 47
2.4.4 Battery installation 49

III. FRONT PANEL **54**

3.1. Introduction 54
3.2. Front panel menu descriptions 54
3.2.1 Measures Menu items 55
3.2.2 Alarms Menu items 55
3.2.3 Information Menu items 55
3.2.4 Adjust Menu items 56
3.2.5 Options Menu items 56
3.2.6 Command Menu items 57
3.2.7 Time Menu items 58
3.2.8 Service Menu items 58
3.3. Status Messages 58
3.4. Shutdown Messages 59
3.5. Fault Messages and Quick Troubleshooting 59

IV. PARALLEL OPERATION **62**

4.1. Introduction 62
4.2. Parallel operation modes of CL-300P series UPSs 63
4.2.1 Parallel Mode 63
4.2.2 Redundant Mode 63
4.2.3 N+1 Redundant Mode 64

Restricted

V. OPERATING INSTRUCTIONS 67

5.1. Introduction 67
5.2 Operating Instruction for a single UPS unit (online operation) 67
5.2.1 Procedure for turning on the UPS to supply the load from a complete Power-off condition 67
5.2.2 Power off 67
5.2.3 Switching into Maintenance Bypass Mode 68
5.2.4 Switching from Maintenance Bypass into normal Operation 68
5.3 Operating Instruction for Parallel connected UPSs 68
5.3.1 Procedure for turning on the UPS (First Installation) 68
5.3.2 Power off 69
5.3.3 Switching the parallel UPS system into Maintenance Bypass mode (Uninterrupted transfer) 69
5.3.4 Switching the parallel UPS system into parallel operation from a Maintenance Bypass power down condition (Uninterrupted transfer) 69

VI. MAINTENANCE 70

6.1. Scheduled Maintenance 70
6.2. Daily checks 70
6.3. Weekly checks 70
6.4. Annual Maintenance 71
6.5. UPS storage and transportation 71

VII. FAULTS AND TROUBLESHOOTING 72

7.1. General procedure for fault checking and Troubleshooting 72

VIII. UPS REMOTE MONITORING AND CONTROL 73

8.1 Using serial port 73
8.1.1 Communication Routing Switch 73
8.2 Serial Communication Cable 74
8.3 Modem Connection 74
8.3.1 Hardware Configuration 74
8.3.2 Functioning Principle 74
8.3.3 Modem Programming Procedure 75
8.3.3.1 Smart Modem Programming (PC Modem) 75
8.3.4 Modem-UPS Connection Cable 75
8.4 Dry contact (interface) Connections 75
8.5 Remote Monitoring Panel 76

Restricted

SAFETY

IMPORTANT NOTICES

1. Read instructions carefully before installing and starting the UPS
2. All warnings in the manual should be adhered to.
3. All operating instructions should be followed.
4. The unit should be supplied by a grounded outlet. Do not operate the unit without a ground source.
5. Power cord of the UPS should be routed carefully so that they are not to be walked on.
6. Please save this manual.
7. Please save or recycle the packaging materials.

WARNING!

- Do not insert any object into ventilation holes or other openings.
- To reduce the risk of fire or electric shock, install in temperature and humidity controlled indoor area free of conductive contaminants.
- To reduce the risk of fire, replace fuses with the same type and rating when necessary.

CAUTION!

- **Only qualified personnel should install or service UPS/batteries.**
- **Risk of electric shock, do not remove cover. No user serviceable parts inside, refer servicing to qualified service personnel.**
- The output may be energized when the unit is not connected to a mains supply.
- **Risk of electric shock! Hazardous live parts inside. This unit is energized from the battery supply even when the input AC power is disconnected.**
- To reduce the risk of electric shock, disconnect the UPS from the mains supply before installing a computer interface signal cable. Reconnect the power cord only after signaling interconnections have been made.

ABOUT THE BATTERIES

CAUTION: RISK OF ELECTRIC SHOCK!

The battery circuit is not isolated from the mains voltage. Hazardous voltages may occur between the battery terminals and the ground!

- A battery can present a risk of electric shock or burn from high short circuit currents. The following precautions should be taken when working on batteries :

  * Remove watches, rings or other metal objects.
  * Use tools with insulated handles.

- The batteries in this UPS are recyclable. Batteries must be disposed of according to local environmental laws. The batteries contain lead and pose a hazard to the environment and human health if not disposed of properly.
- Do not dispose of batteries in a fire. The batteries may explode. Do not open or mutilate the batteries. They contain an electrolyte which is toxic and harmful to the skin and eyes. If electrolyte comes into contact with the skin the affected area should be washed immediately.
- The internal energy source (the battery) cannot be de-energized by the user.
- When changing batteries, install the same number and same type of batteries.

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I. GENERAL DESCRIPTION

1.1 Introduction

TESCOM CL-300P Series Uninterruptible Power Supplies are double-conversion, on-line UPS's manufactured with the latest IGBT and PWM technology, to produce an uninterruptible, microprocessor controlled pure sine wave output to critical loads.

TESCOM CL-300P Series units are 3-phase in/3-phase out devices, and they are installed between a three phase critical load, and a 3-phase+N mains supply

The advantages of using CL-300P UPS:

- Power blackout protection:
  If the mains power fails, the UPS continues to supply the critical load using the energy stored in its batteries, keeping the load immune from power disturbances.
- Increased power quality:
  The UPS has its own internal voltage and frequency regulating circuits, which ensure that, its output to the critical load is maintained within close tolerances, independent of voltage and frequency variations on the mains power lines.
- Increased noise rejection:
  By rectifying the input AC power to DC power and then converting it back to AC (Double-Conversion) any electrical noise present on the input mains supply line is effectively isolated from the UPS output. Therefore the critical load is supplied with only clean and uninterrupted AC power.

Basic Features :

- Microprocessor Controlled
- Double Conversion, on-line UPS
- IGBT Rectifier (PWM)
- High Input PF
- Low THDI
- IGBT Inverter (PWM)
- Sinusoidal output Waveform.
- Low output Voltage THD
- High Nonlinear Load capacity (CF 3:1)
- High Unbalanced loading capability.
- Efficiency Up to 94%
- Overload and short circuit Protection
- Overtemperature protection
- Static Bypass Switch
- Maintenance Bypass Switch
- Separate bypass input facility (split Bypass)
- Parallel Operation (Optional)
- LCD Display
- Alarm History (Up to 128 Alarms)
- Real time clock (date and time)
- Emergency Power off (EPO)
- Cold-start feature (optional)
- Dual Polarity Batteries (Internal and/or external)
- Automatic and manual Battery Test
- Automatic and manual Boost Charge
- Battery current limit adjust
- Deep discharge protection
- AC input filter
- AC output filter
- Alarm relay contacts (Standard)
- RS232 communication port (Standard)
- RS485 interface (Optional)
- SNMP adapter (Optional)
- Remote monitoring Panel (Optional)

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- RS232 port multiplexer (Optional)
- MODBUS adapter (Optional)
- Diagnostic and adjustment via PC.
- Input and/or output isolation transformers (optional)

1.2 Design Concept

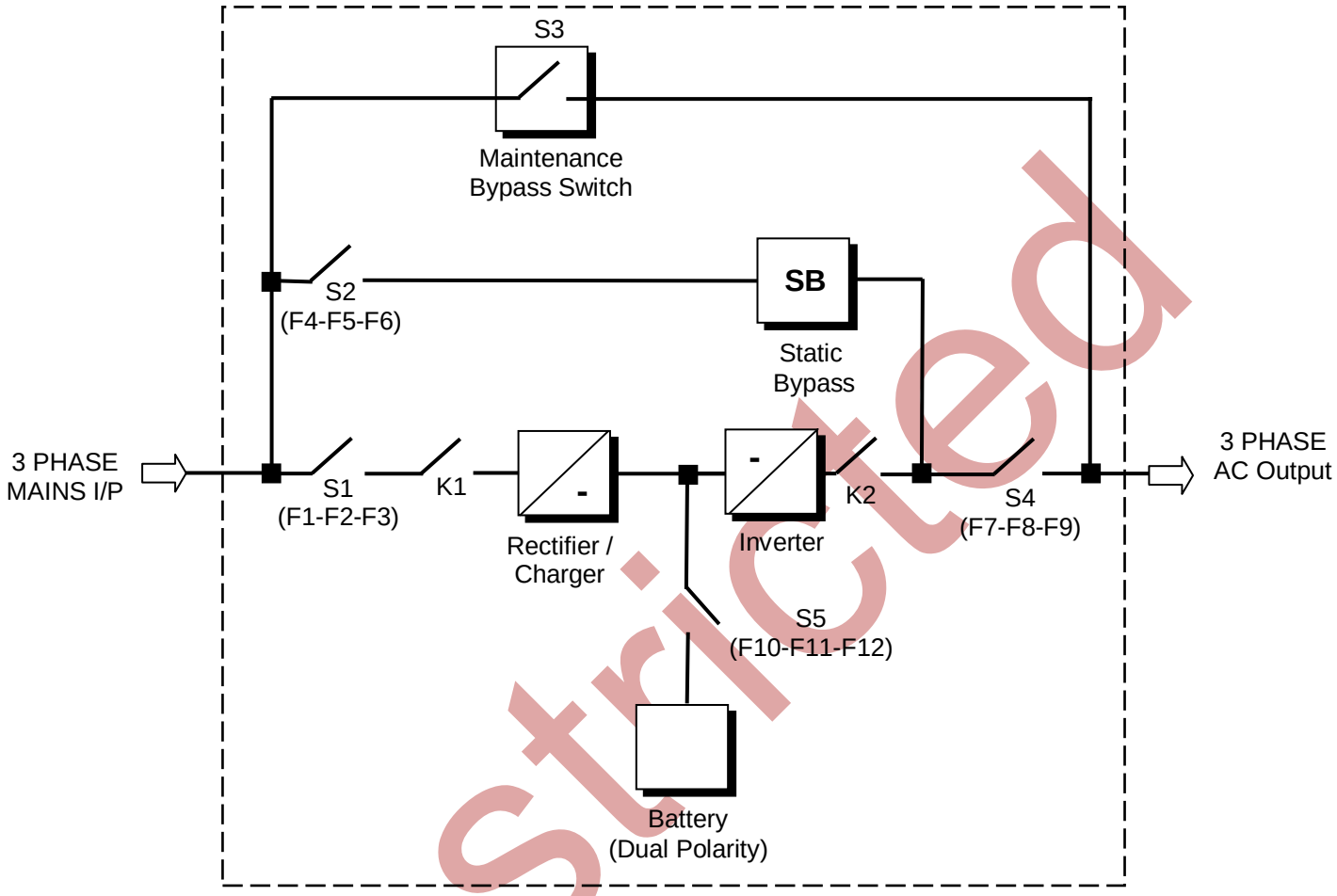

Figure 1.1 Block Diagram Of The UPS

S1 (F1-F2-F3) : Rectifier Input Switch / Fuses
S2 (F4-F5-F6) : Bypass Input Switch / Fuse
S3 : Maintenance Bypass Switch
S4 (F7-F8-F9) : Output Switch / Fuse
S5 (F10-F11-F12) : Battery Switch / Fuses
K1 : Rectifier Input Contactor
K2 : Inverter Output Contactor

DESCRIPTION OF BLOCKS

RECTIFIER: In CL-300P Series UPSs, a PWM controlled IGBT rectifier is used to increase input power factor (PFC) and to decrease input current harmonics (THDI).

The IGBT rectifier accepts 3-phase AC input and produces a dual polarity DC voltage for both supplying the inverter and charging the batteries.

BATTERIES: Batteries are used as reserve DC power supply for the Inverter in case of mains failure. In CL-300P Series, batteries are connected in series with a center-tap output to obtain a dual polarity DC supply.

Batteries are discharged by the inverter during mains failure. The discharged batteries are re-charged by the IGBT Rectifier on a constant current / constant voltage basis, if AC mains power is available.

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INVERTER: It is manufactured by using the latest IGBT technology and Pulse width Modulation (PWM) technique. The Inverter converts the DC BUS voltage supplied by the IGBT Rectifier and / or the batteries into a well regulated 3-phase AC voltage with fixed voltage and frequency.

The output of the inverter is used to supply the critical loads connected to the UPS output.

STATIC TRANSFER SWITCH (STATIC BYPASS) : This is an electronically controlled transfer switch, which enables the critical load to be connected either to inverter output or to a by-pass power source. During normal operation, the load is supplied by the inverter output, but in case of an overload it is automatically transferred to the bypass source without any interruption.

MAINTENANCE BYPASS SWITCH (MBS) : This is a manually controlled mechanical switch, which is used to supply the critical load, using the bypass source, when the UPS is shut down for maintenance or troubleshooting purposes.
The load is unprotected against mains supply disturbances and black-outs when it is connected to either static or maintenance bypass supply.

1.2.1 OPERATING MODES OF UPS

CL300P series UPSs are capable of operating in various different modes for maximum application flexibility. These modes are:

- **ONLINE mode:** This is the normal operation mode for a single UPS. As long as the mains supply is available and in required tolerances, the load is supplied by the well regulated inverter output and the batteries are charged at the same time. In case of mains failure, the inverter keeps supplying the load using the energy stored in the batteries.

- **ECONO mode:** This is the off-line operation mode for a single UPS. As long as the mains supply is available and in required tolerances, the load is supplied by the mains supply (bypass supply) via the Static Bypass Switch of the UPS and the batteries are charged at the same time. During that time inverter keeps running under no-load conditions and takes over the load in case of a mains supply (bypass supply) failure, without any interruption. After restoration of the mains supply the load is transferred back to bypass supply again.

- **PARALLEL, REDUNDANT** and **N+1 REDUNDANT modes** are used for parallel operation of two or more UPS units and will be explained in parallel operation section later in this manual.

When operating in one of the above operating modes, UPS may be in one of the following operating conditions:

A. Normal Operation (If Mains supply is available):
All fuses and power switches are closed (except the Maintenance Bypass Switch), and the load is supplied by the Inverter Output. During normal operation, the Rectifier supplies DC power to the Inverter and charges the Batteries at the same time.

B. Battery Operation :
The Batteries are connected to the Rectifier output. In case of a mains failure (mains power outage or AC input voltage out of tolerance), the Rectifier stops operating and the DC voltage necessary for the inverter operation is supplied by the batteries. Therefore the AC voltage output supplying the critical load is not interrupted, until the batteries are fully discharged. At the end of the discharging time the Inverter is turned off and it start again automatically, together with the Rectifier, when the mains power is restored, and the UPS returns o normal operation.

The Rectifier is also turned off and Inverter operates on batteries during automatic or manual battery test procedure.

C. By-Pass Operation :
If the Inverter output is overloaded or in case of a problem in the UPS, the static switch transfers the load to the bypass supply without any interruption, provided that the bypass supply is available and within the tolerated limits.

At the end of the overloading period, if the fault condition is restored, static switch transfers the critical load again to the inverter output. Note that, during operation from the bypass supply, the critical load may be effected by any possible disturbances or power failure in the bypass supply.

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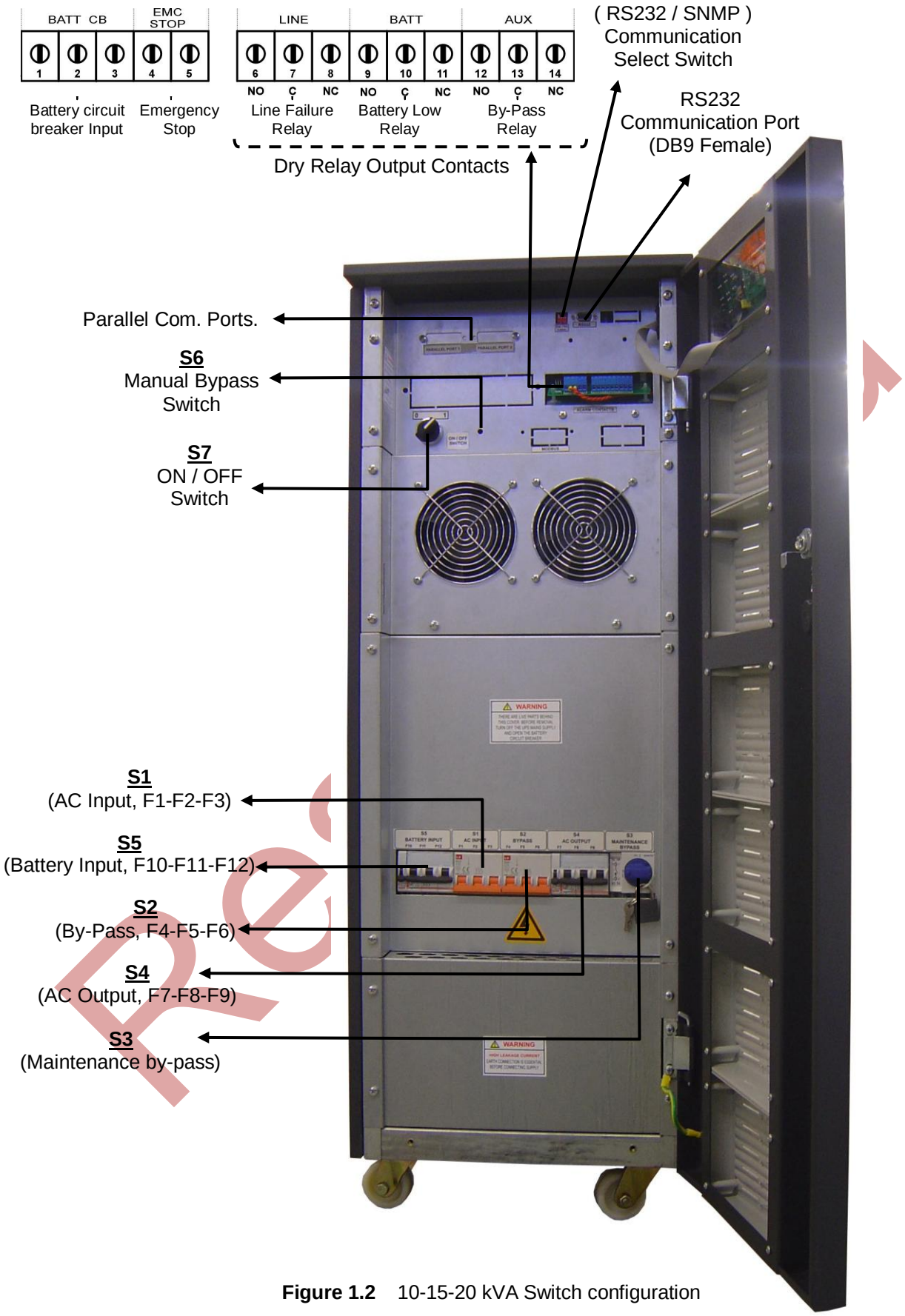

Figure 1.2 10-15-20 kVA Switch configuration

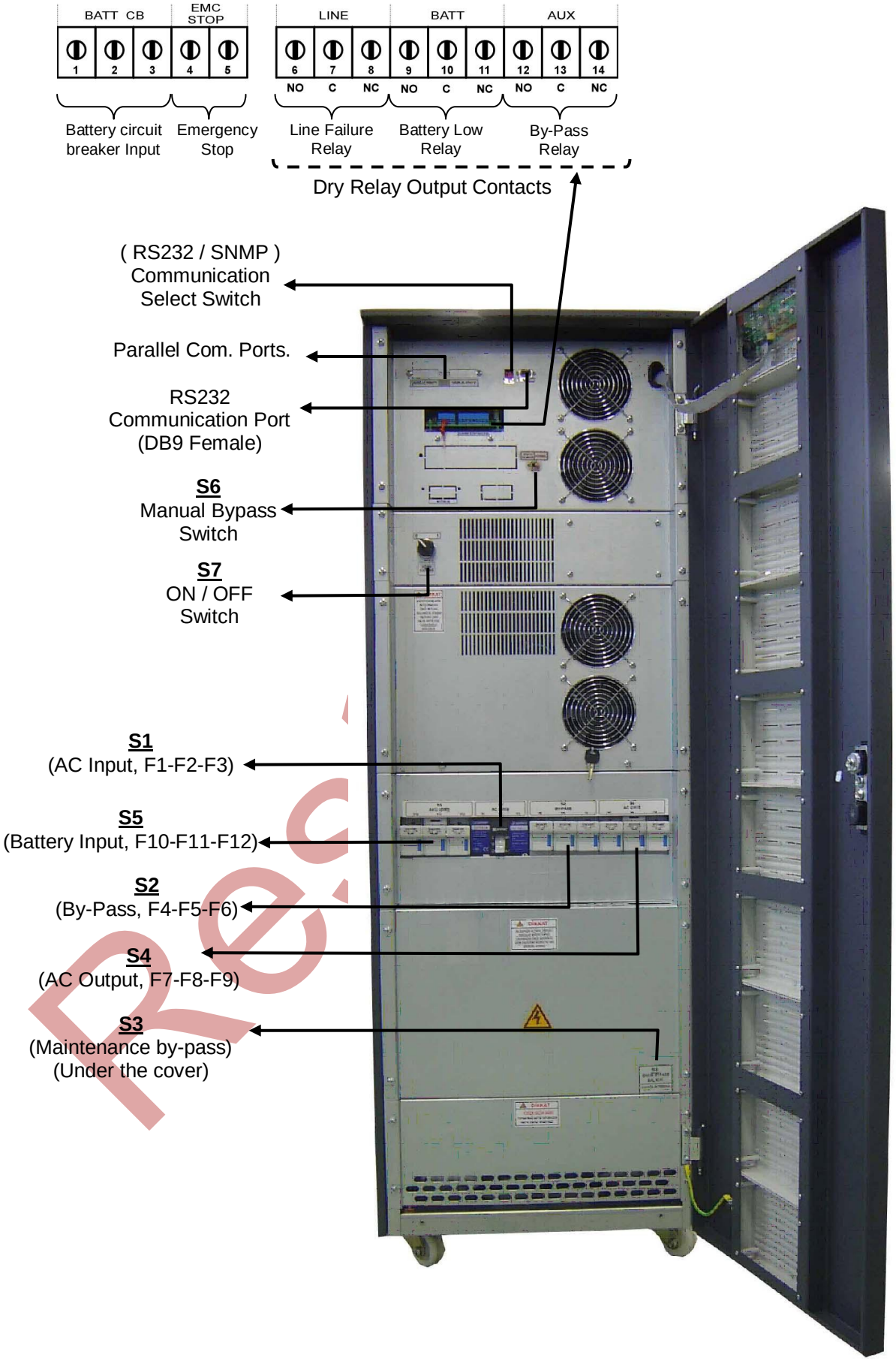

Figure 1.3 30-40 kVA Switch configuration

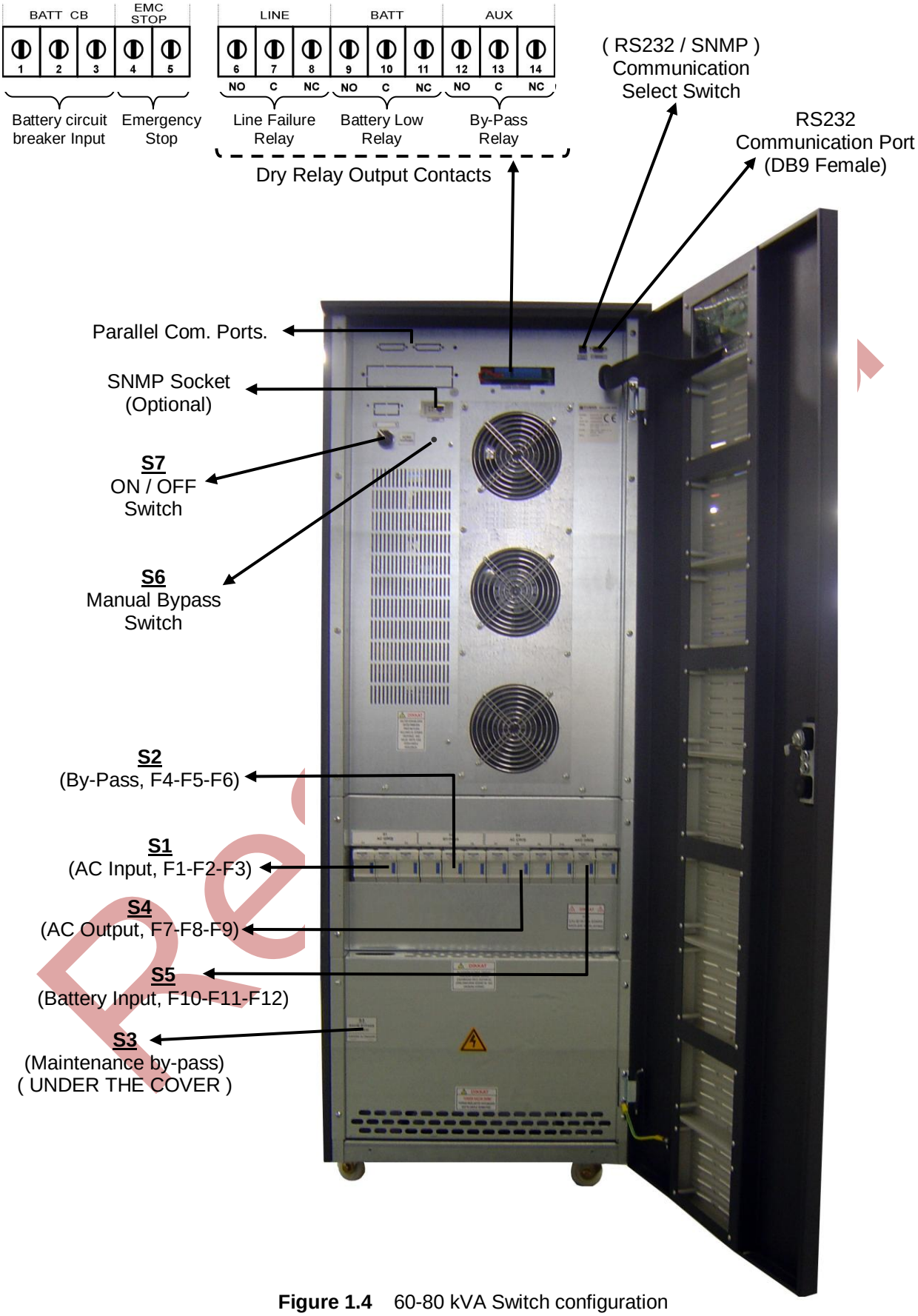

Figure 1.4 60-80 kVA Switch configuration

1.3 Technical Specifications

MODEL	CL310P	CL315P	CL320P	CL330P	CL340P	CL360P	CL380P
Output (KVA)	10	15	20	30	40	60	80
Output (KW)	8	12	16	24	32	48	64
Output Power Factor	0,8						
INPUT							
Number of Phases	3 Phase + Neutral						
Input Voltage	220/380 Vac , 230/400Vac or 240/415Vac 3phase+N						
Input Voltage Tolerance	+20%,-25% (+15% , -30% for 240/415Vac)						
Input Power Factor (PF)	0,98 - 0,99 (at full load)						
Input THDI	≤ 5 % (at full load)						
Input Frequency	50Hz ± 5 %						
By-pass Voltage	220/380 Vac , 230/400Vac or 240/415Vac 3phase+N						
By-pass Frequency	50Hz						
By-pass Frequency Tolerance	(± 2 %)						
RFI Level	EN50091						
Split By-pass Connection	Available						
OUTPUT							
Number of phases	3 Phase + Neutral						
Output Voltage	220/380 Vac , 230/400Vac or 240/415Vac 3phase+N						
Output Voltage Tolerance	± 1 %						
Output Frequency	50 Hz						
Output Frequency Tolerance (line synchron)	(± 2 %)						
Output Frequency Tolerance (free running)	± 0,2 %						
Efficiency (at full linear load)	up to 94 %						
Load Crest Factor	3 : 1						
Output Voltage THD	≤ 3 %						
Overload	125% Load 10min. , 150% Load 1min.						
BATTERIES							
Total Number	60 (2x30) pieces 12V						
Float Charge Voltage (25^0C)	± 405 Vdc						
End of Discharge Voltage	± 300 Vdc						
Battery Test	Automatic and Manual						
Boost Charge	Available						
INTERFACE							
RS 232 comm. port	Standard (Optional port multiplexer available)						
RS 485 comm. port	Optional						
Remote Monitoring Panel	Optional						
SNMP Adapter	Optional						
Modbus Adapter	Optional						
Alarm Relay Contacts	3x Dry Relay Contacts (Line failure, battery low, bypass)						
EPO Input	Standard						
ENVIRONMENT							
Operating Temperature	0 - 40^0C						
Operating Humidity	< 90% (Non-Condensing)						
Acoustic Noise	≤ 50 dB			≤ 55 dB		≤ 63 dB	≤ 65 dB
Dimensions (HxWxD) (mm)	1035 x 375 x 735			1440 x 495 x 845		1440 x 515 x 845	
Protection Class	IP20						

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1.4 CL300P Series UPS Basic Diagrams

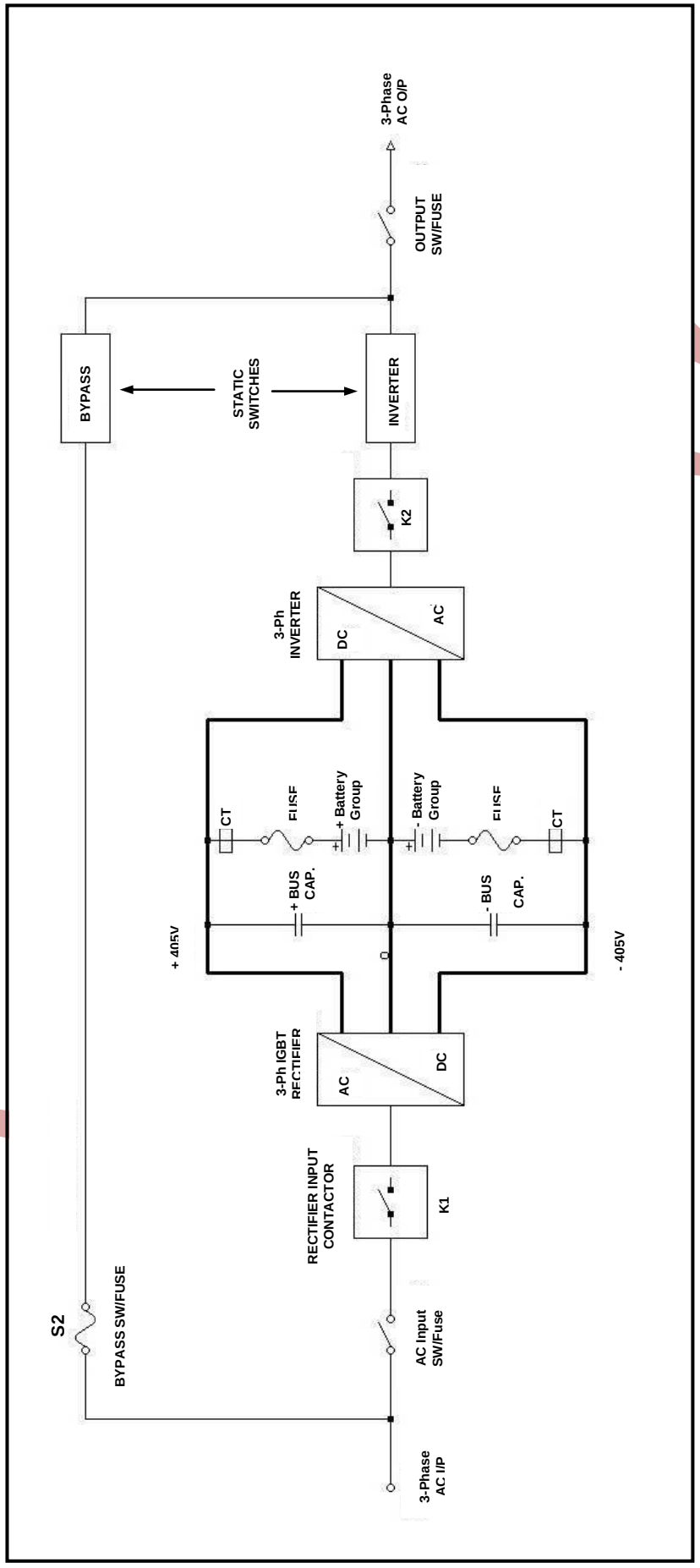

Figure. 1.5.1 CYCLONE SERIES 3 Ph / 3 Ph UPS BLOCK DIAGRAM

R

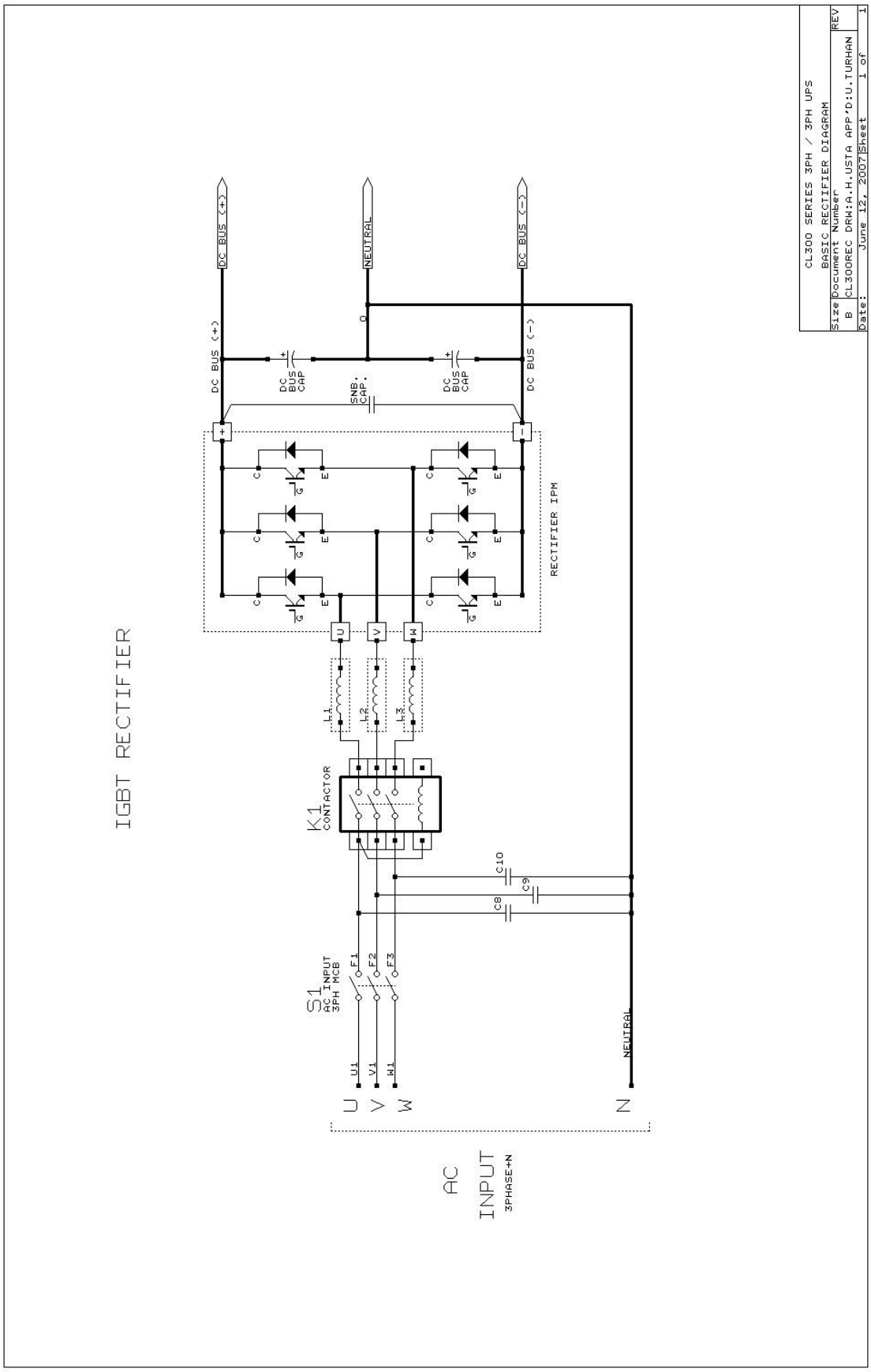

Figure 1.5.2 IGBT Rectifier

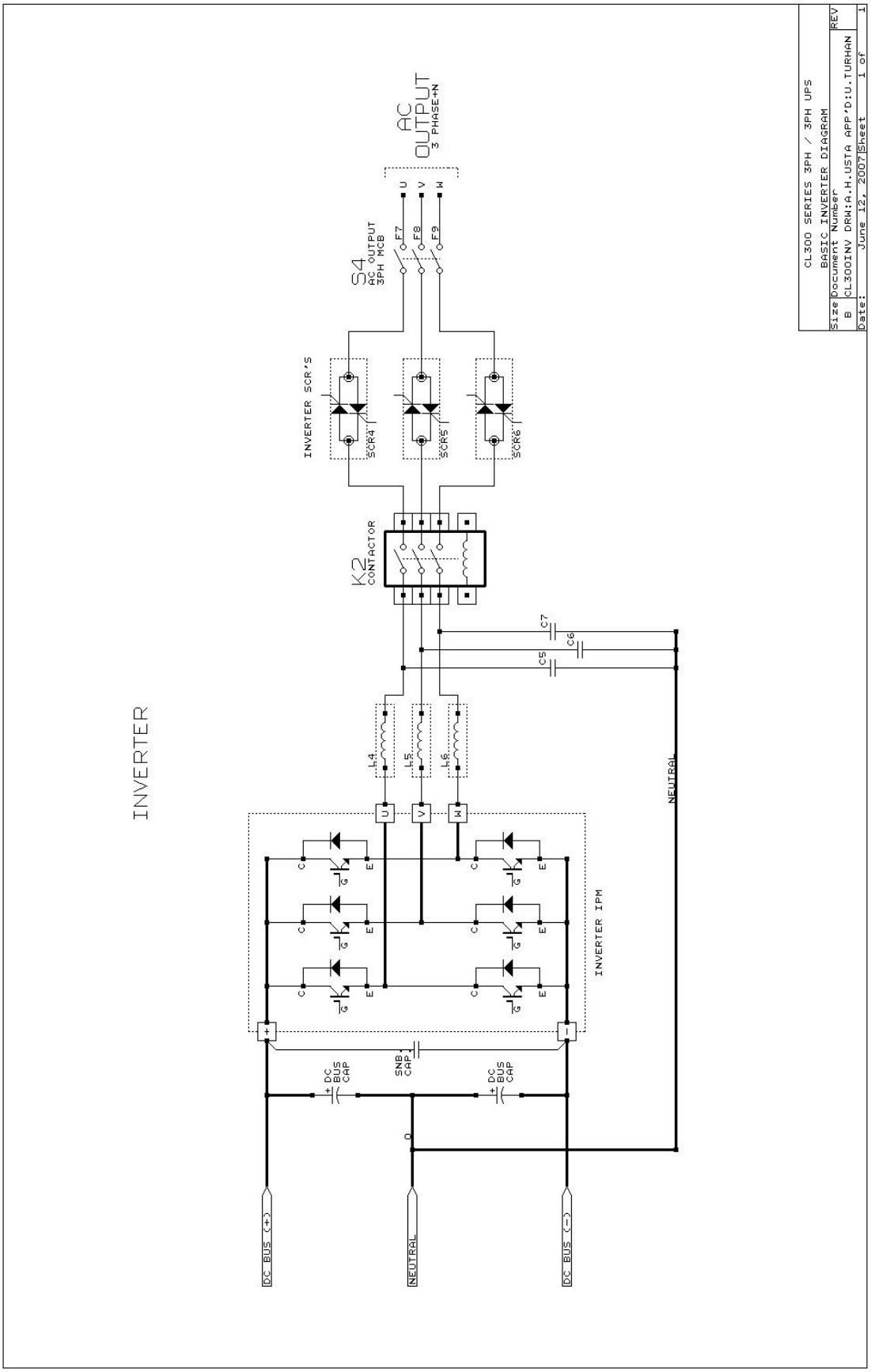

Figure 1.5.3 Transformerless 3-Phase Inverter

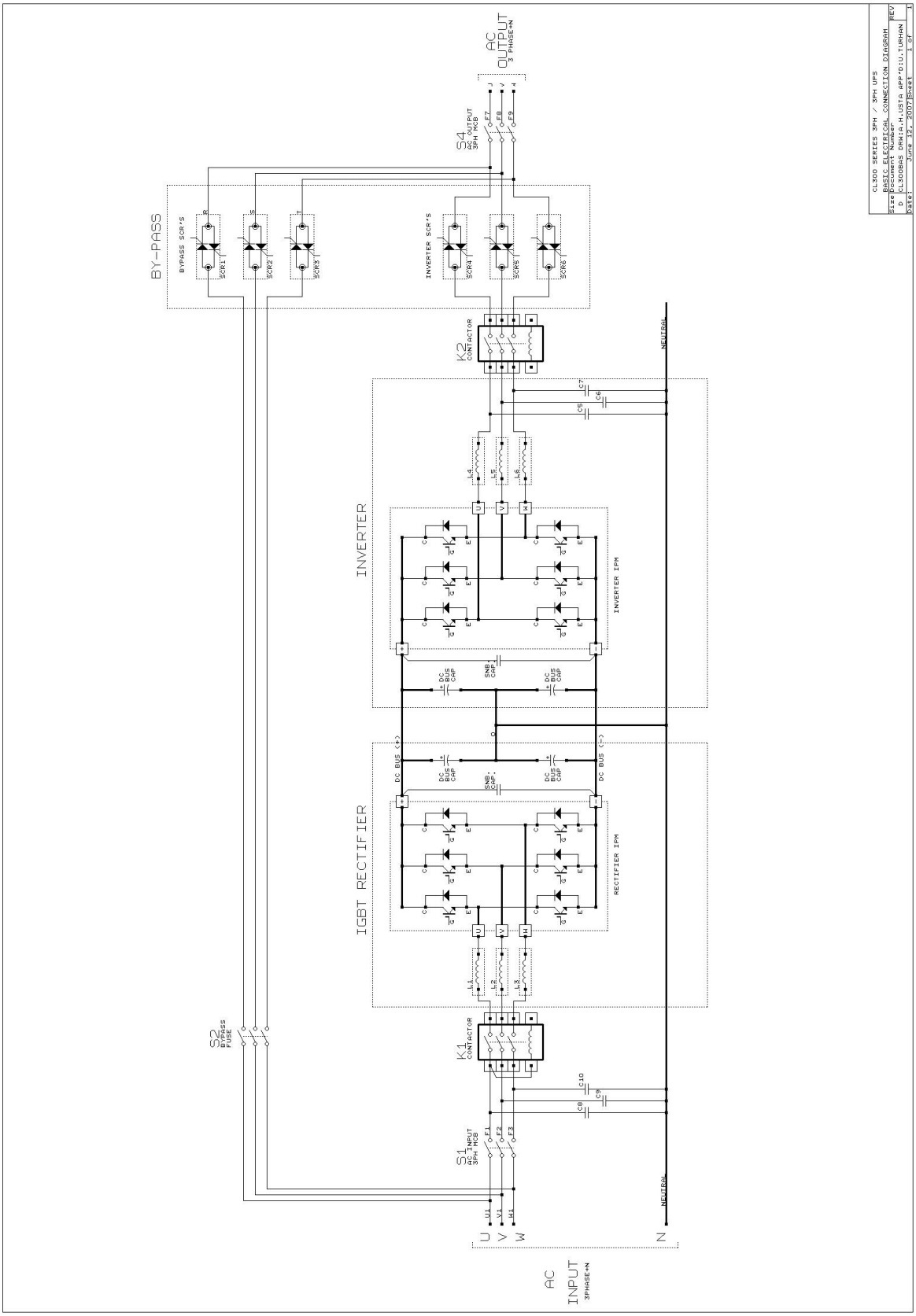

Figure 1.5.4 CL300P UPS Basic Diagram

1.5 CL-300P SERIES UPS ELECTRONIC CONTROL BOARDS

You will find below a list of PCBs used in CL300P Series 3 Phase in / 3 Phase out UPSs :

1	PFC3P-R2	⇒	3 PHASE POWER FACTOR CORRECTION BOARD (IGBT RECTIFIER CONTROLLER BOARD)
2	IPMD3P (2 pieces)	⇒	IPM (INTELLIGENT POWER MODULE) DRIVER BOARD (Used in 10-15-20-30 and 40kVA)
3	P3MC-R5	⇒	UPS MAIN CONTROLLER BOARD
4	ADVS01-R3	⇒	DC - 3 PHASE AC VOLTAGE SAMPLE BOARD
5	SDXC300-R3	⇒	BYPASS & INVERTER SCR DRIVER BOARD
6	STP01-R2	⇒	SWITCHING POWER SUPPLY BOARD
7	MODPAN02-R1	⇒	LCD PANEL BOARD
8	ITF3-R2	⇒	3 Ph / 3 Ph UPS INTERFACE BOARD
9	RS330-R1	⇒	SERIAL COMMUNICATION (RS232) BOARD
10	STM01	⇒	OUTPUT MONITORING BOARD
11	OPS3-R1	⇒	3 PH VOLTAGE AND CURRENT SAMPLE BOARD
12	CPC02	⇒	CAPACITOR CHARGER BOARD
13	CUR03 or CT311	⇒	CURRENT TRANSFORMER BOARD (3 Ph)
14	PARA04	⇒	PARALLEL OPERATION CONTROLLER BOARD
15	PARA3PX	⇒	3 Ph PARALLEL CURRENT SAMPLING BOARD
16	PAI33	⇒	PARALLEL SOCKET BOARD
17	LEM3200	⇒	CURRENT TRANSFORMER PS BOARD (Used in 60-80kVA)
18	IGD3P-REV3	⇒	IGBT DRIVER & POWER SUPPLY BOARD (Used in 60-80kVA)

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1.5.1 PCB LOCATIONS

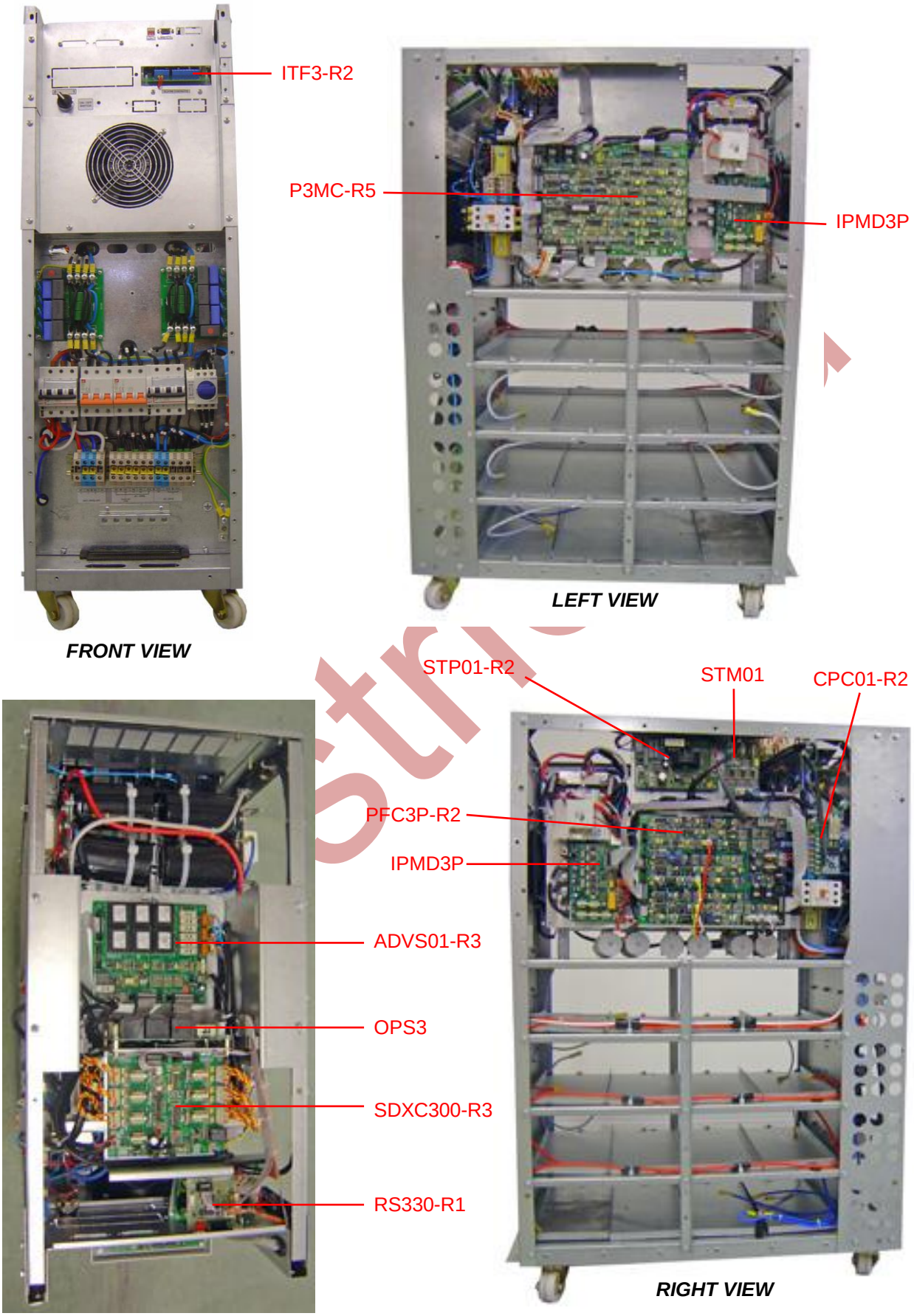

Figure 1.6.1 10-15-20 kVA

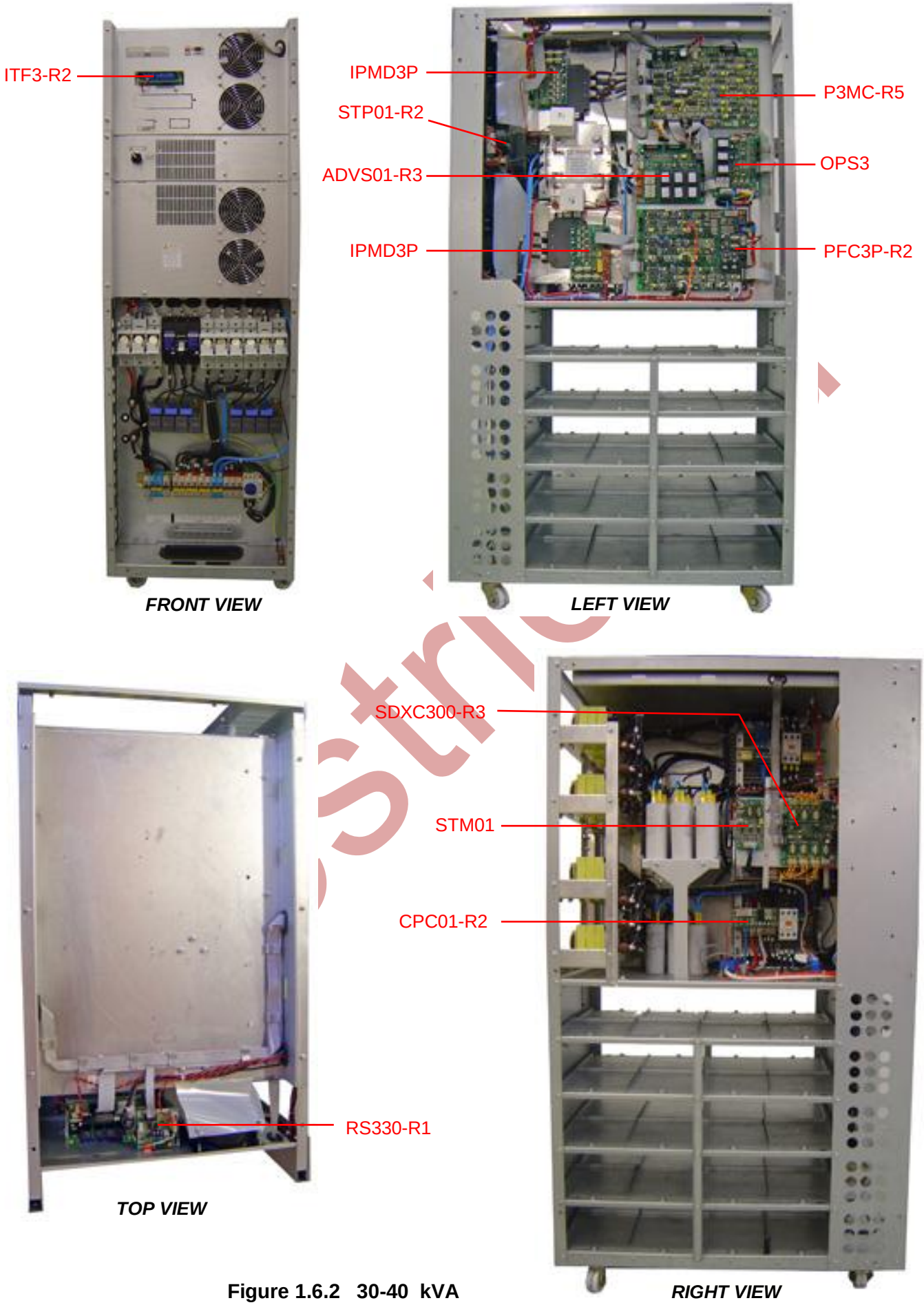

Figure 1.6.2 30-40 kVA

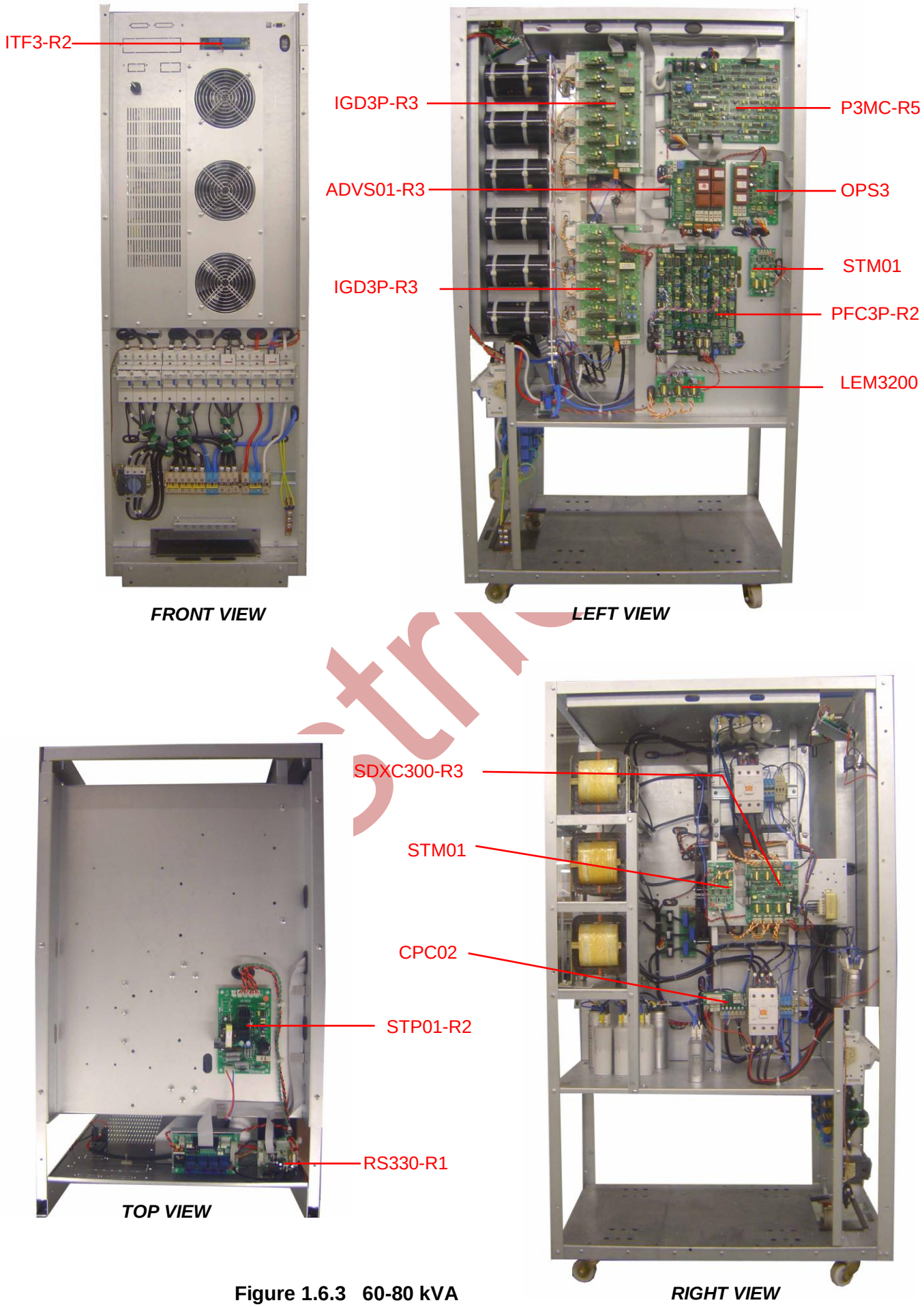

Figure 1.6.3 60-80 kVA

1.5.2 PFC3P-R2 IGBT RECTIFIER CONTROLLER BOARD:

This electronic controller board is used to control the 3-Phase IGBT Rectifier at the input stage of the CL300P series tansformerless Uninterruptible Power Supplies. By using an IGBT rectifier and this control board, the ınput power factor of the UPS is corrected (to 0.99 at full load) and the input current THD is improved (less than 5% at full load).

A) Basic functions of PFC3P:

1. It takes the 3-Phase AC ınput voltage and current samples coming to the IGBT rectifier and generates necessary PWM- IGBT driving signals to correct the input pF and to decrease the input current distortion (THDI). The signals for the control of each phase is generated independently.

2. It takes the positive and negative DC output voltage samples of the rectifier and adjust the driving signal pulse widhts to keep these DC voltages constant under normal loading conditions. In case of overloading of the IGBT rectifier, the rectifier output voltages are decreased to limit the rectifier output and thus the UPS input current. Different current limiting values for different UPS power ratings can be set by changing some fixed resistors on PFC3P board (R63, R124 and R186).

3. In CL300P series UPSs, the IGBT rectifier produces a dual polarity DC voltage at its output to supply the transformerless Inverter stage. The batteries which are the reserve energy supply for the UPS are directly connected to the rectifier outputs again as two separate battery groups with opposite polarity. The total number of batteries (12V), in a standard CL300P series UPS, is 60 (30+30). Thirty batteries are used for one polarity and the other thirty are used for the opposite polarity. The float charging voltage value for 2X30 batteries is +/- 405V dc. Therefore the no-load output voltage of the IGBT rectifier is adjusted to +/- 405V (810V dc total).

During normal operation, IGBT rectifier supplies power to the Inverter and charges the batteries at the same time. PFC3P board takes the battery current samples and adjusts the IGBT driving signals to limit the maximum battery charging current to a pre-adjusted safe value suitable for the VA rating of the batteries. Therefore the output voltages of the rectifier change in accordance with the battery voltages during the charging period of the batteries.

4. PFC3P board accepts some control signals from UPS Main Controller Board (P3MC-R5) and performs the following functions:

- Boost Charge: During boost charge, the rectifier output voltages are increased to the boost charging voltage level for the batteries and kept at that level until the end of the boost charging period. At the end of the boost charging period, the rectifier output voltages are decreased to the float charge level again. The boost charge voltages for positive and negative battery groups are adjusted separately on PFC3P board.

- Rectifier Start: When the P3MC-R5 board sends a ‘’Rectifier Start’’ signal to the PFC3P-R1 board, the input contactor (K1) is energized and the IGBT rectifer starts operating.

- Battery Test: When the P3MC-R5 board sends a ‘’Battery Test’’ signal to the PFC3P board, the rectifier output voltages are both decreased to a preadjusted value and kept at that level until the end of the battery test procedure.

5. On the other hand, PFC3P board sends the following signals to the UPS Main Controller Board:

1. ‘’Rectifier Fault’’
2. ‘’ Positive battery group current sample (either charging or discharging)
3. ‘’ Negative ‘’ ‘’ ‘’ ‘’ ‘’
4. ‘’ Negative battery voltage sample’’

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B) Adjustments of PFC3P IGBT Rectifier Controller Board:

-AR1 : Rectifier output voltage with only R-phase operation, (increases CW)

-AR2 : '' '' '' '' S-phase '' ''

-AR3 : Positive (+) battery group boost charge voltage, (increases CW)

-AR4 : Negative (-) '' '' '' '' ''

-AR5 : (+) and (-) battery groups battery test voltage level, (increases CW)

-AR6 : AC input currents THD adjustment,

-AR7 : (-) battery group charging current limit, (increases CW)

-AR8 : (+) '' '' '' '' '' ''

-AR9 : Rectifier output voltage with only T-phase operation, (increases CW)

-AR10 : Rectifier negative (-) output voltage, (a single adjustment for equalizing the neg. output voltage to the poz. output voltage, increases CW)

-AR11 : Rectifier fault threshold level adjustment.

C) PFC3P Test Points

-TP1 : R-phase, full-wave rectified AC input voltage sample, (……. V peak at 220V)
-TP2 : R-phase IGBT driving signals (0-12V)
-TP3 : R-phase, AC input voltage sample, (……..V dc at 220V)
-TP4 : R-phase, AC input current sample,
-TP5 : Electronic GND (= input line Neutral)
-TP6 : S-phase, full-wave rectified AC input voltage sample, (…..V peak at 220V)
-TP7 : S-phase IGBT driving signals (0-12V)
-TP8 : S-phase, AC input voltage sample (….. V dc at 220V)
-TP9 : S-phase, AC input current sample,
-TP10 : +12V dc (+/- 0.5V)
-TP11 : -12V dc (+/- 0.5V)
-TP12 : +17V dc (+/- 1.0V)
-TP13 : T-phase, full-wave rectified AC input voltage sample, (….V peak at 220V)
-TP14 : T-phase IGBT driving signals (0-12V)
-TP15 : T-phase, AC input voltage sample (…V dc at 220V)
-TP16 : T-phase, AC input current sample,

D) PFC3P board ''jumper'' positions

There are various jumper connections on the board which are inserted or removed during testing or normal operation of the rectifier. Their list and positions are given below:

During normal operation:

JP5=JP8=JP12=JP17 = ''1'' (inserted or short circuited)

JP1=JP2=JP3=JP4=JP6=JP7=JP9=JP10=JP11=JP13=JP14=JP15=JP16=JP18=JP19 = ''0'' (removed)

Note: JP1, JP9 and JP16 are used to start or stop the IGBT rectifier phase by phase. They are used to enable or disable the rectifier to operate on the desired input phase (or phases). If JP1, for example, is inserted then the rectifier stops using the R-phase (stops generating driving signals for R-phase) for generating its DC output. If it is removed then the rectifier starts using R-phase. JP9 and JP16 do the same for S and T-phases respectively. During rectifier output voltage adjustments, they are removed one by one to adjust the output voltage when operating on each phase separately.

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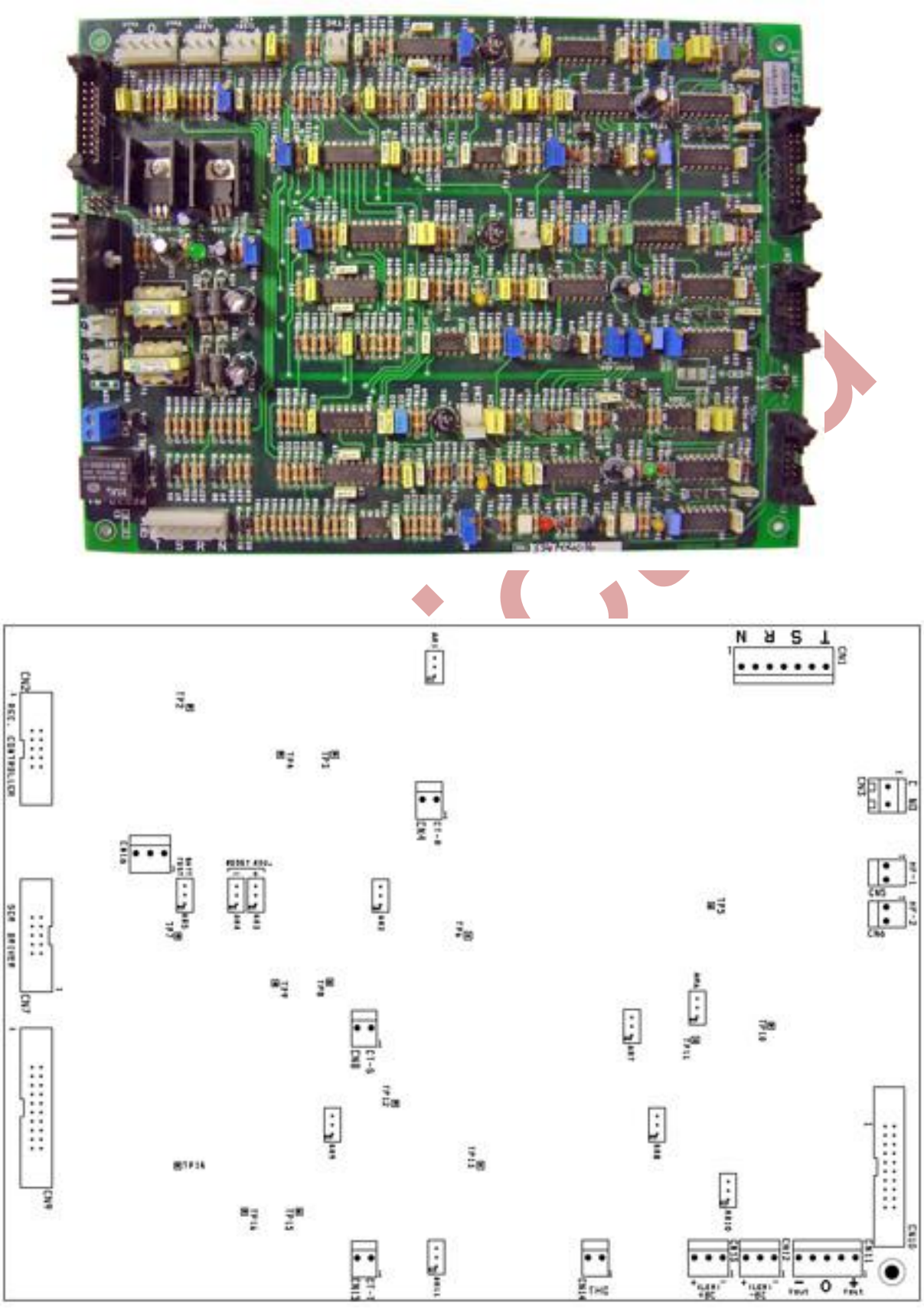

Figure 1.6.4 PFC3P-R1 Board

1.5.3 IPMD3P INTELLIGENT POWER MODULE (IPM) DRIVER BOARD

This driver board is used to drive the Intelligent Power Modules which are used in the IGBT rectifier and the Inverter stages of CL300P series UPSs ranging from 10kVA to 40kVa.

A) Basic functions of IPMD3P

1. It takes (CN7) the HF supply signal generated by the power supply board (STP01) and produces the following DC supply voltages necessary for its operation:

- +24V DC
- As soon as HF supply signal is applied to CN7, this +24V is generated and indicated by LD2 (green LED) on the board.
- Four different +15V DC supply voltages which are all floating. These isolated supply voltages are used for driving the gates of the IGBTs (six IGBTs connected to form a three-phase full bridge) in the IPM.

2. The HF supply signal coming to CN7, is passed through the NO contact of RL1 relay and distubuted to the electronic control boards of the UPS via CN3, CN4, CN5 and CN6 sockets.

3. IPMD3P board monitors the (+) battery voltage (DC bus voltage) connected to CN2. If this voltage reaches to a certain predetermined value, RL1 is turned on and HF supply voltage is applied to all electronic boards and this is indicated by LD1 (green). If the (+) DC bus voltage is below that value, RL1 is de-energized and the supply voltage to electronic control boards and to the IGBT drivers are turned off.

4. This board accepts (CN1) the driving signals generated by the rectifier controller board (PFC3P-R1) or by the main controller board (P3MC-R5) and transfers them to the gates of the IGBTs through optical isolators.

5. This board sends back a fault signal (overtemperature or overcurrent) generated by the IPM to the controller board (either PFC3P-R1 or P3MC-R5). This fault signal is available at CN1-1.

6. The jumper JP1 on this board can be short-circuited to simulate a fault signal for test purposes (JP1 is normally open).

7. The (+) DC bus voltage (battery voltage) connected to CN2 is used to supply (+) battery voltage sample to the main controller board (CN1-2)

B) IPMD3P Board Test Points

-TP1 : GND4 (R-phase, upper -leg driving supply common point)
-TP2 : VCC4 (" " " +15Vdc)
-TP3 : GND3 (S-phase, upper-leg driving supply common point)
-TP4 : VCC3 (" " " +15Vdc)
-TP5 : GND2 (T-phase, upper-leg driving supply common point)
-TP6 : VCC2 (" " " +15Vdc)
-TP7 : GND1 (R, S and T-phases, lower-legs driving supply common point)
-TP8 : VCC1 (" " " " +15Vdc)

Note1: In a CL300P series UPS, there are two IPMD3P boards; one for driving the rectifier IPM and one for driving the inverter IPM.

Note2: The same IPM driver board can be used in the following UPS units without any change:

-CL310P	10kVA	3Ph/3Ph UPS
-CL315P	15kVA	"
-CL320P	20kVA	"
-CL330P	30kVA	"
-CL340P	40kVA	"

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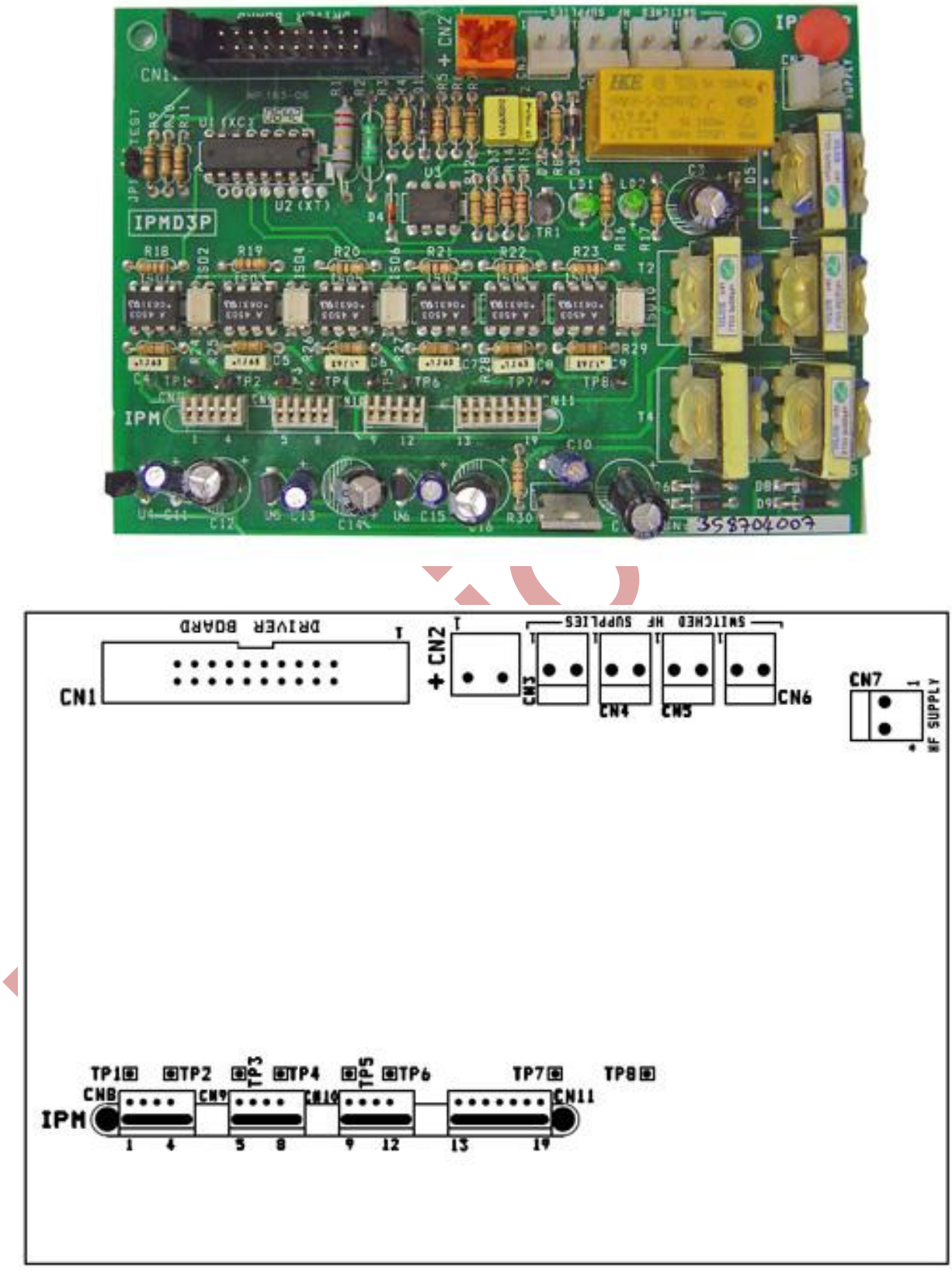

Figure 1.6.5 IPMD3P Board

1.5.4 P3MC-R5 UPS MAIN CONTROLLER BOARD

This board is used to control the Inverter operation and general UPS functions. Various analog and digital data related to the operation of the UPS are collected by this microprocessor controlled board and necessary control signals are generated and sent to other electronic boards

A) Basic functions of P3MC-R5

1. It generates PWM signals for driving the Inverter IGBTs
2. It accepts AC output voltage (3 phase) samples and controls the ınverter output voltages.
3. Inverter output frequency and synchronization controls are performed on this board.
4. All the variables and messages about the UPS operation are displayed on the LCD panel controlled by this board.
5. All protection alarm signals of UPS are generated by this board.
6. It controls the start/stop and timing functions of the IGBT rectifier and the Inverter.
7. It also controls the communication functions of the UPS.

B) P3MC-R5 UPS Main Controller Board Signal Inputs/Outputs

. CN1 : 2X15V AC supply input (not used in CL300P series)
. CN2 : It ıs connected to CN7 of the SDXC300-R1 board

Pin1-Pin2	0 volt (GND)
Pin4	IGBT rectifier ‘’start’’ signal output
Pin6	‘’Start boost charge’’ signal output
Pin7	‘’+’’ battery current sample
Pin8	Bypass enable/disable signal output
Pin9	‘’ Rectifier fault’’ signal input
Pin10	Inverter output contactor (K2) driving signal output
Pin11	‘’ Rotate phase’’ alarm signal input (not used in CL300P series UPS)
Pin12	‘’ Battery test’’ signal output
Pin13-Pin14	+12V supply output

. CN3 : It is connected to CN7 of ADVS01-R1 board. The same signals are taken out from CN8 of ADVS01-R1 and connected to CN2 of ITF3-R2 board too.

Pin1	Bypass relay (alarm) driving signal output
Pin2	Battery low ‘’ ‘’ ‘’ ‘’
Pin3	Line failure ‘’ ‘’ ‘’ ‘’
Pin4	Emergency stop (EPO) signal input
Pin5	Battery trip relay driving signal output.
Pin6	Battery trip input
Pin7-Pin9	+12V supply output
Pin10	Power supply sense input
Pin11-Pin13	0 volt (GND)
Pin12	‘’DC fault’’ signal input
Pin14	Spare input (digital)
Pin16	Manuel bypass switch input
Pin18	Fuse-fault sense input
Pin19	Thermal contact input
Pin20	Maintenance bypass switch sense input

. CN4 : LCD panel is connected to this socket

Pin1,3,5,7,9	0volt (GND)
Pin11-Pin13	+5V supply
Pin2	Key5 input
Pin4	Key4 input
Pin6	Key3 input
Pin8	Key2 input
Pin10	Key1 input

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- CN5 : It is connected to CN3 of the RS330-R1 board

Pin1-Pin3	0volt (GND)
Pin5-Pin7	+5V supply
Pin2	---------
Pin4	---------
Pin6	Com1 RX input
Pin8	Com1 TX output

- CN6 : Cabinet temperature measurement sensor is connected to this socket.

Pin1	0volt
Pin2	----
Pin3	Sensor + input

- CN7 : UPS output current transformers' signal outputs are connected to this socket

Pin1	L3 phase output current transformer + input
Pin2	L3 " " " " - input
Pin3	L2 " " " " + input
Pin4	L2 " " " " - input
Pin5	L1 " " " " + input
Pin6	L1 " " " " - input

- CN8 : It is connected to CN7 of OPS3 board and to CN10 of PFC3P-R1 board at the same time.

- CN9 : It is connected to CN3 of ADVS01-R1 board.

Pin4-Pin6	L1 phase bypass voltage sample (2x12V AC)
Pin1-Pin2	L2 " " " " "
Pin3-Pin5	L3 " " " " "
Pin15-Pin16	L1 phase inverter output voltage sample (2x12V AC)
Pin12-Pin14	L2 " " " " " "
Pin8-Pin10	L3 " " " " " "
Pin11-Pin13	+6V (connected to the midpoints of voltage sampling transformer outputs)

-CN10 : It is connected to CN1 of IPMD3P board

Pin1	IGBT fault (overcurrent) signal input
Pin2	"+" battery voltage sample
Pin3-Pin4	+12V
Pin5-Pin6	0 volt (GND)
Pin9-Pin10	R phase inverter driving signal (upper IGBT)
Pin11-Pin12	R " " " " (lower IGBT)
Pin13-Pin14	S " " " " (upper IGBT)
Pin15-Pin16	S " " " " (lower IGBT)
Pin17-Pin18	T " " " " (upper IGBT)
Pin19-Pin20	T " " " " (lower IGBT)

-CN11 : It is connected to CN7 of PARA04 board.

C) Adjustments of P3MC-R5 UPS Main Controller Board:

-VR1 : L3 (or T) phase inverter output DC balance adjustment (cw +)
-VR2 : L3 " " " voltage adjustment (increases cw)
-VR3 : L2 (or S) phase inverter output DC balance adjustment (cw +)
-VR4 : L2 (or S) phase inverter output voltage adjustment (increases cw)
-VR5 : L1 (or R) phase inverter output DC balance adjustment (cw +)
-VR6 : L1 (or R) phase inverter output voltage adjustment (increases cw)
-VR7 : Inverter output all three phases common voltage adjustment (increase cw)
-VR8 : PLL mode frequency adjustment (increases cw)
-VR9 : Line synchronization adjustment

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1. Inverter Output Voltage Adjustment

- When the inverter is running, connect an AC voltmeter to the inverter outputs (TP3, TP4 and TP5 on ADVS01-R1 board).
- Keeping VR2, VR4, and V6 at approximately their mid-position, adjust the output voltages (roughly) to their nominal value using VR7.
- Then re-adjust each phase voltage separately, again using VR2, VR4 and VR6 to their exact values this time.

2. DC Balance Adjustment

- When the inverter is running, connect a DC voltmeter to the inverter outputs (TP3, TP4 and TP5 on ADVS01-R1 board)
- Adjust the DC voltage component of each phase of the inverter output to be ZERO, using VR1, VR3 and VR5.

3. Inverter Output PLL Frequency Adjustment (for 50Hz nominal value)

- When the inverter is running, connect a frequencymeter to one of the inverter output phases (either one of TP3, TP4 or TP5 on ADVS01-R1 board)
- Connect TP18 to TP12 (+12V) using a jumper wire and adjust the frequency to 51.4+/-0.1Hz using VR8.
- Disconnect TP18 from TP12 and connect it to TP9(0V) this time (TP18-TP9) and check if the output frequency is 48.6+/-0.1Hz.
- Repeat the adjustment procedure until you have equal frequency deviation around the center frequency (50Hz)
- Let TP18 be NOT CONNECTED to anywhere and see that the inverter output frequency is equal to the bypass supply (line voltage) frequency.

4. Inverter Output Synchronization Adjustment

- Connect an AC voltmeter across the L3 phase of the inverter output (TP3 on the ADVS01-01 board) and the L3 phase of the bypass input (TP6 on the ADVS01-01 board).
- Adjust VR9 to minimize the measured AC voltage across these points.

D) P3MC Board Main Test Points

-TP3 : Triangle wave (9600Hz)
-TP5 : +5V supply voltage
-TP6 : +20V supply voltage
-TP8 : +6V supply voltage
-TP9 : 0V (GND)
-TP12 : +12V supply voltage
-TP18 : PLL analog signal (TP18 is connected either to +12V or to 0V during frequency adjustment)
-TP106 : L1 phase 50Hz square wave signal
-TP206 : L2 " " "
-TP306 : L3 " " "
-TP104 : L1 phase output feedback error signal
-TP204 : L2 " " " "
-TP304 : L3 " " " "
-TP107 : L1 phase reference sine-wave sample
-TP207 : L2 " " "
-TP307 : L3 " " "

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Additional Test Points:

-REF1 : +2.5V reference zener diode voltage
-U10-Pin7 : 11V DC
-U10-Pin6 : 2.5V DC
-U10-Pin1 : 0V DC
-U16-Pin11 :0V DC
-U38-Pin10 : 19200Hz square wave
-U39-Pin3 : 50Hz square wave
-U39-Pin14 : 50Hz square wave

E) P3MC-R5 Board ‘’jumper’’ positions:

There is only one ‘’jumper’’ on this board which is JP1. It is used to enable or disable some protection functions of the controller board.

During normal operation:
- JP1 = “1’’ (inserted or short-circuited)

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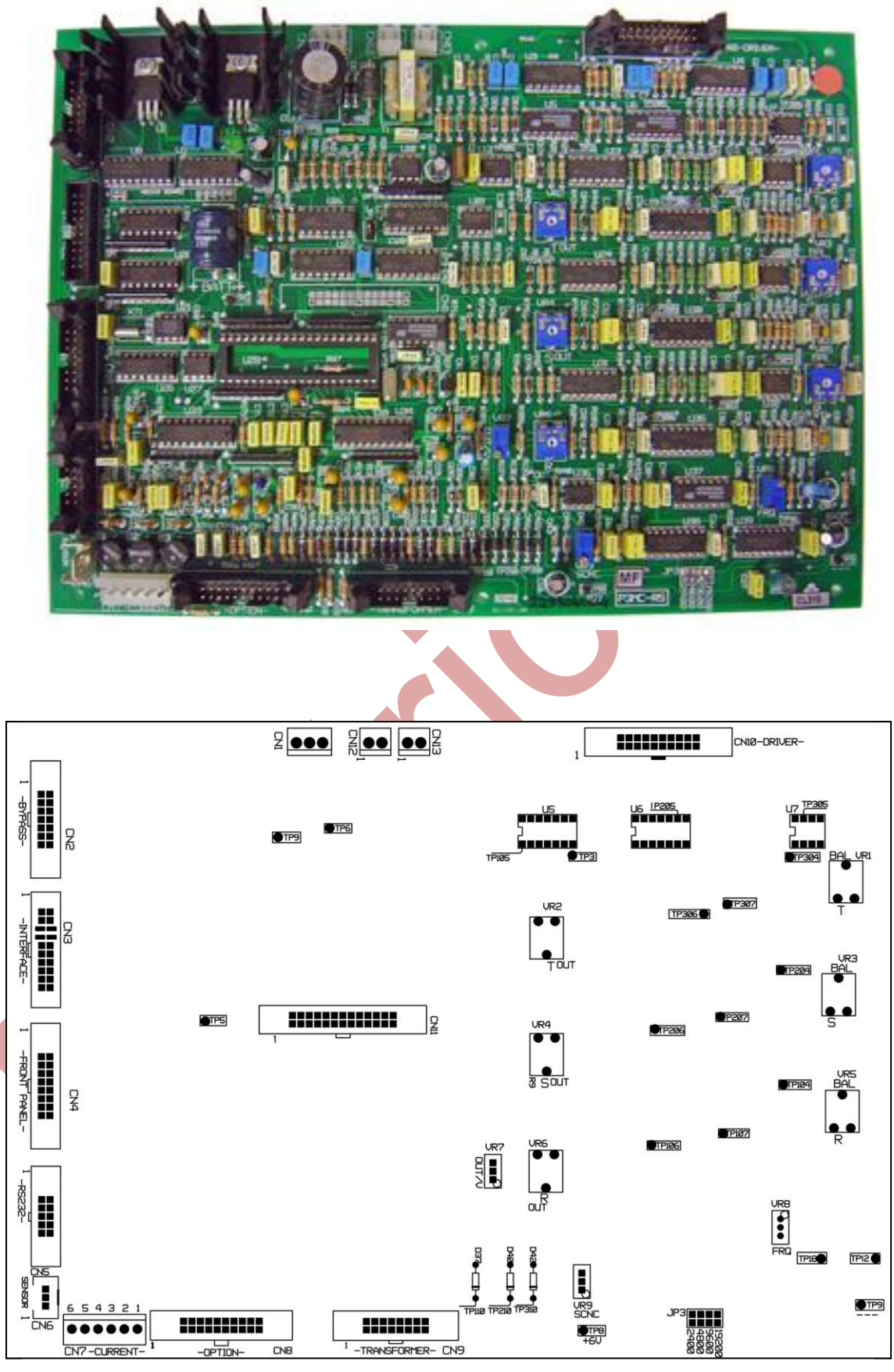

Figure 1.6.6 P3MC-R5 Board

1.5.5 ADVS01-R3 DC-3 PHASE AC VOLTAGE SAMPLE BOARD

This board accepts the inverter output voltages and bypass input voltages of the UPS and sends suitable AC and DC feedback signals to the main controller (P3MC-R5) board for measurement and control.

A) Basic Functions of ADVS01:

1. Inverter output voltages (phase-neutral) are connected to CN2. The inverter output voltages are stepped down and level shifted by the transformers T1, T2 and T3 and they are fed back to the main controller board P3MC-R5 through CN3 of ADVS01. These signals are used for measurement and control of ınverter output voltages and their waveforms.

   - CN2-1 : Inverter output T-phase (220-230V AC to T3 through the fuse F1)
   - CN2-2 : Inverter output S-phase ('' T2 '' F2)
   - CN2-3 : Inverter output R-phase ('' T1 '' F3)
   - CN1-1 : Inverter output Neutral

2. The inverter output voltages connected to CN2 are divided down, by resistors, to a suitable level and directly connected to the main controller board through CN7 of ADVS01. These dc-coupled inverter output voltage samples are used to eliminate any possible DC voltage components of the AC outputs after performing DC balance adjustments using VR1, VR3 and VR5 on the main controller board (P3MC-R5).

3. The DC components of the inverter output voltages coming to CN2 are checked continuously and if the magnitude of this DC component is greater than +/-3Vdc then a ''DC Balance Failure'' signal is produced and sent to the main controller board (P3MC-R5) via CN7-Pin12 of ADVS01 board. When this fault signal is produced, LD1 (red LED) is turned on. The ''DC fault'' signal is available on CN9 and any other external fault signal can be connected in parallel with this signal (e.g. the ''output fault'' signal coming from CN2 of STM01 board is connected to CN9 of ADVS01 board) to act in the same way.

4. Bypass input voltages (phase-neutral) are connected to CN4. The bypass voltages are stepped down and level shifted by the transformers T4, T5 and T6 and they are transferred to the main controller board P3MC-R5 through CN3 of ADVS01. These bypass voltage samples are used for measurement and synchronization on the main controller board.

   - CN4-1 : Bypass input T-phase (220-230V AC to T6 through the fuse F4)
   - CN4-2 : Bypass input S-phase ('' '' T5 '' '' F5)
   - CN4-3 : Bypass input R-phase ('' '' T4 '' '' F6)
   - CN1-3 : Bypass Neutral

   Note: Since inverter output and bypass Neutrals are the same in CL300P UPSs, J1 jumper is always short-circuited.

5. The NO contact of the RL1 relay on ADVS01 board is connected in series with the NO contact of the RL1 relay on the SDXC300-R1 board. These relays are used for energizing the coil of the ınverter output contactor (K2), and if any one of those relays is turned off, then the inverter output contactor is de-energized too.

   When a ''DC balance failure'' signal is produced on the ADVS01 board, RL1 relay on this board is turned off and the inverter output contactor (K2) is de-energized to prevent any DC voltage to reach UPS output. To enable this protection, JP1 on this board should be inserted (JP1 = ''1'').

   The same function is also performed by the controller software when the ''DC fault'' signal is received by the main controller board (this time by turning off RL1 on SDXC300-R1 board).

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B) ADVS01 Board Test Points

-TP1 : Inverter output Neutral
-TP2 : Bypass (Line) Neutral
-TP3 : Inverter output T-Phase (220-230VAC)
-TP4 : Inverter output S-Phase ('')
-TP5 : Inverter output R-Phase ('')
-TP6 : Bypass input T-Phase ('')
-TP7 : Bypass input S-Phase ('')
-TP8 : Bypass input R-Phase ('')
-TP9 : 4.8 +/-0.1 VDC (Vref1)
-TP10: 3.3 +/-0.1 VDC (Vref2)
-TP11: +12VDC (+/-0.5V)

C) ADVS01 Board ''jumper'' Positions

J1 = J2 = ''1'' (inserted or short-circuited)
JP1 = ''1'' (DC fault protection enabled)

D) ADVS01 Board Fuses

F1 : Inverter output sample T-Phase (315mA)
F2 : Inverter output sample S-Phase ('')
F3 : Inverter output sample R-Phase ('')
F4 : Bypass input sample T-Phase ('')
F5 : Bypass input sample S-Phase ('')
F6 : Bypass input sample R-Phase ('')
F7 : Inverter output contactor (K2) coil fuse (2 Amper)

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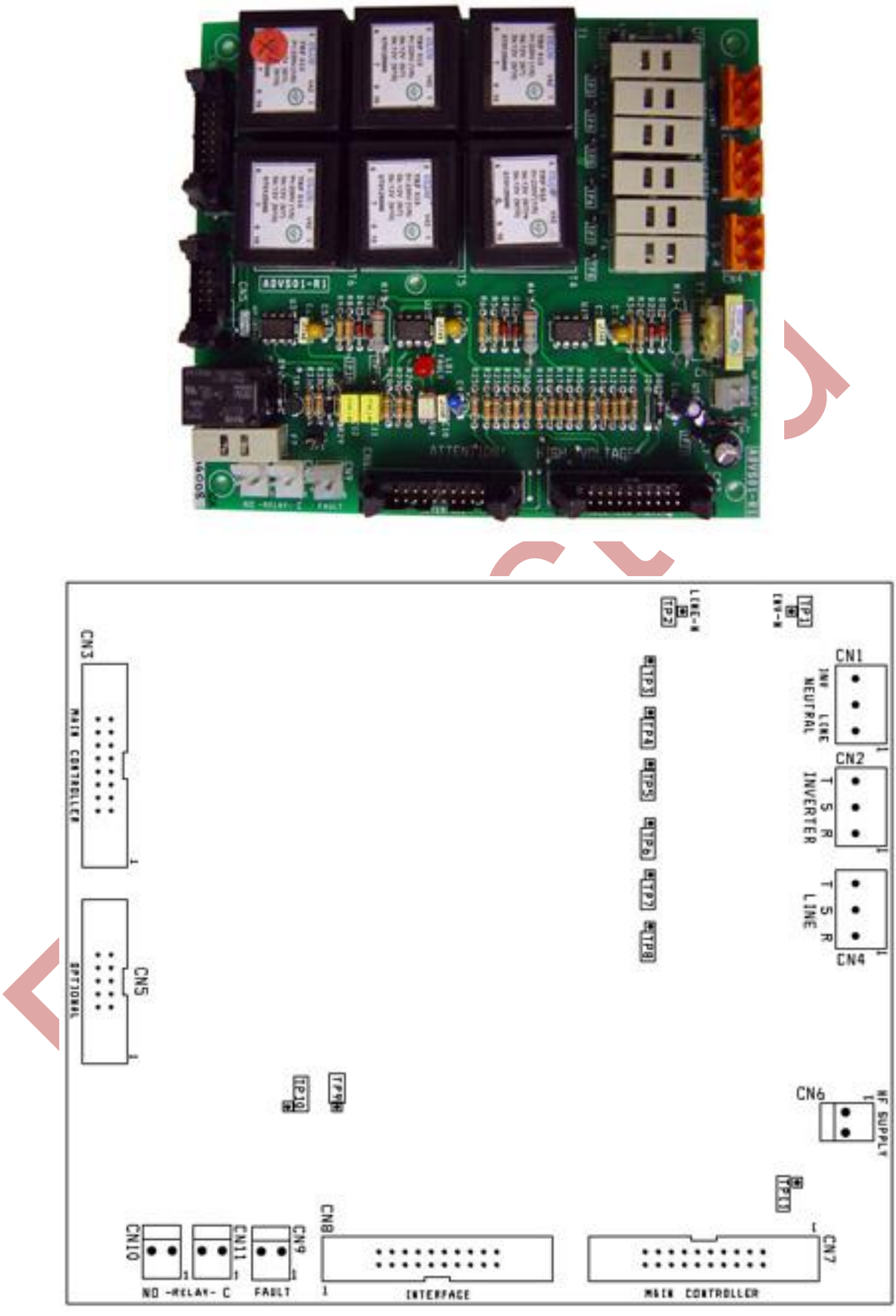

Figure 1.6.7 ADVS01-R1 Board

1.5.6 SDXC300-R3 BYPASS AND INVERTER SCR DRIVER BOARD

This board is used to drive six pairs of SCRs which are used as AC switches for transferring the load between the inverter output and the bypass supply.

A) Basic Functions of SDXC300 Board

1. It accepts the control signals from the main controller board via its CN7 socket and generates gate drive pulses for either Inverter or Bypass SCRs. Gate drive pulses (7-8kHz) are generated and gated on this board.

2. It also accepts the control signal from the main controller board to energize or de-energize the inverter output contactor (K2). The NO contact of relay RL1 is used for this purpose (CN14).

3. SDXC300 board is supplied by HF supply signals connected to CN4 or CN5.

B) SDXC300 Board Test Points

-TP1 : +17V DC (+/-2V)
-TP2 : +12V DC (+/-0.5V)
-TP3 : SCR gate pulse oscillator O/P (approx. 25usec ‘’1’’, 100usec ‘’0’’)

C) SDXC300 Board Indicator Lamps

- LD1 (red LED) : It is turned on when the bypass SCRs are conducting (‘’BYPASS’’)
- LD2 (green LED) : It is turned on when the inverter SCRs are conducting (‘’INVERTER’’)
- LD3 (green LED) : It is turned on when the inverter output contactor (K2) is energized.

D) SDXC300 Board ‘’jumper’’ Positions

For CL300P series UPSs;

JP1 = ‘’0’’ (not inserted or open-circuited)
JP2 = ‘’1’’ (inserted or short-circuited)
JP3 = ‘’1’’ ‘’
JP4 = ‘’1’’ ‘’

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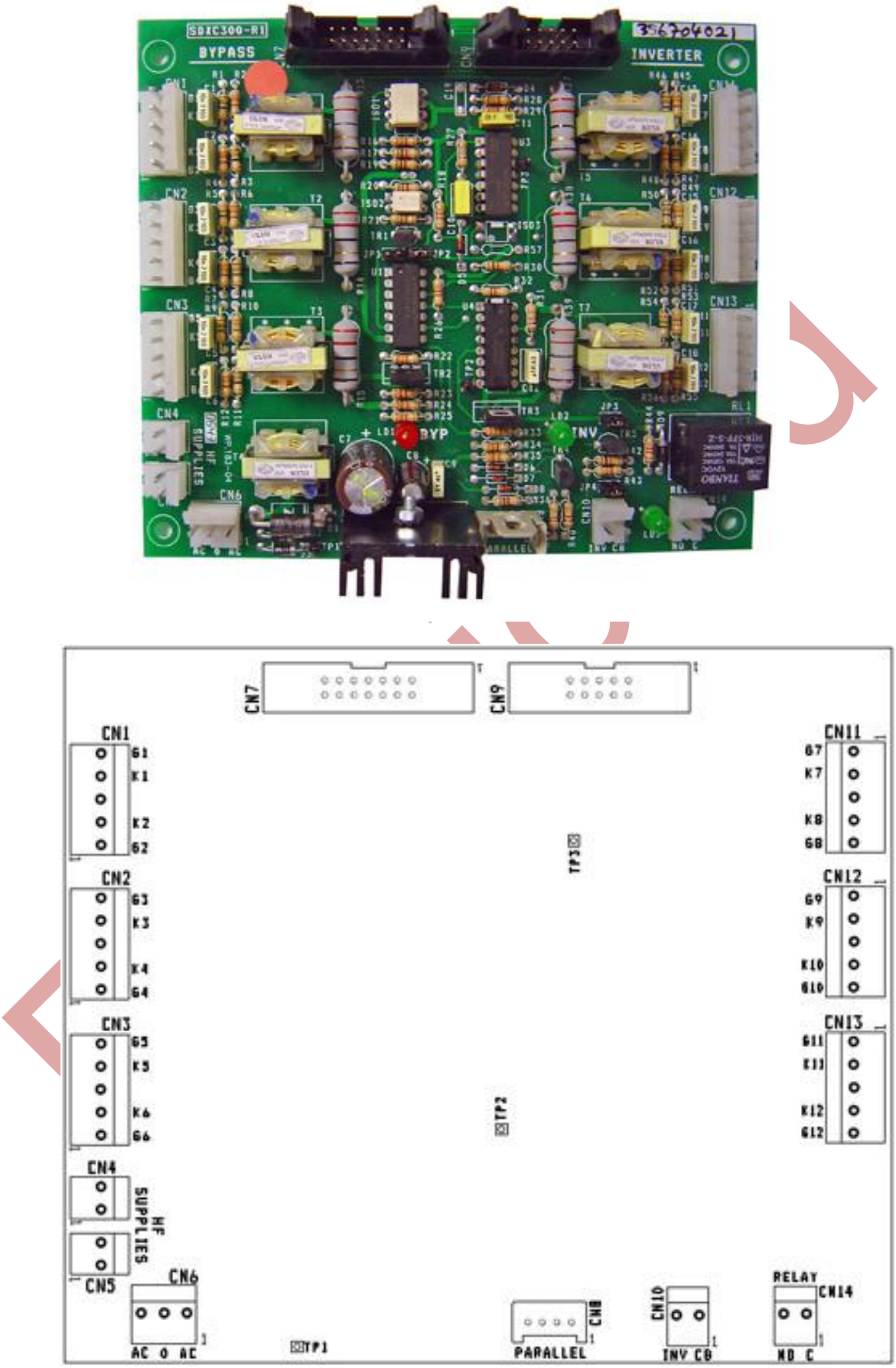

Figure 1.6.8 SDXC300-R1 Board

1.5.7 STP01-R3 SWITCHING POWER SUPPLY BOARD

This board generates the HF supply signals for the operation of all the electronic boards used in a CL300P series UPS.

A) Basic Functions of STP01 Board

1. It uses the AC (200-240V) or DC (280-432V) voltage coming to its CN1 socket to produce HF (high frequency) supply signals for the operation of electronic control boards of the UPS. HF supply signals are available on the output sockets (CN2, CN3, CN4, CN5, CN6) and distributed to the other boards. The HF (AC) supply signals are used to produce the necessary positive and/or negative DC supply voltages for the operation of each board.

- CN1-1 : Input COMMON (Neutral)
- CN1-2 : Input supply (AC or DC)
- CN1-3 : ‘’ ‘’ “
- CN1-4 : ‘’ ‘’ ”

2. When the ON/OFF switch of the UPS is turned on, the ‘’+’’ DC bus voltage (+battery voltage) is connected to CN1-4 and STP01 board starts generating HF supply signals. This is indicated by LD1 (green LED). All the electronic boards supplied by HF signals start operating and the UPS starts. When the DC bus voltage is turned off using ON/OFF switch, HF supply signals are not generated anymore and the UPS stops.

3. There is a fuse (F1) at the input of the STP01 board. If this fuse is blown or not inserted at all, HF supply signals are not produced and the UPS doesn’t start even if the ON/OFF switch is turned on.

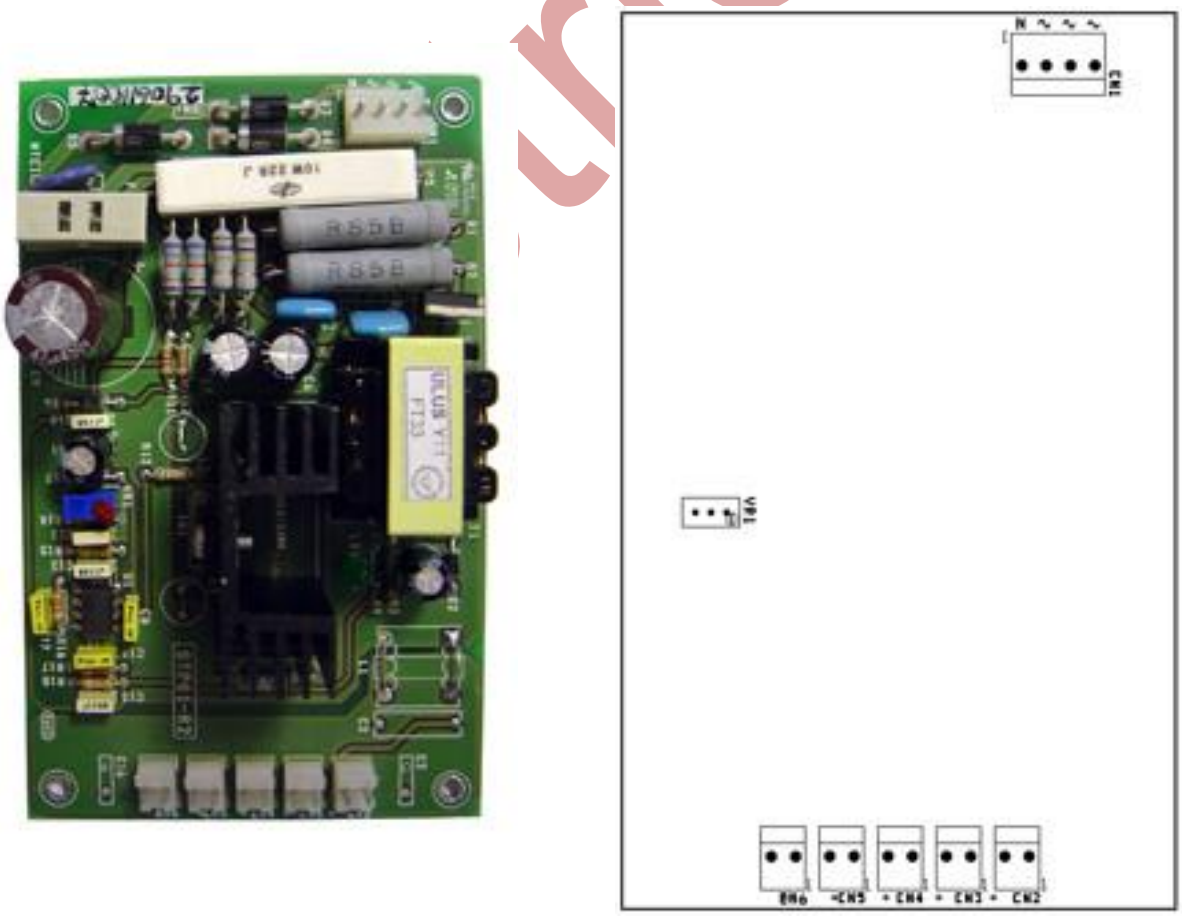

Figure 1.6.9 STP01-R2 Board

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1.5.8 ITF3-R2 3Ph/3Ph UPS INTERFACE BOARD

This board contains dry relay contact outputs and inputs for alarm interfacing of the UPS. Power supply sense input are also on this board and if there is no supply voltage, an alarm is produced and the UPS doesn't start.

Various auxiliary switch and thermal contact connections are also available on this board and these contact positions are transferred to the main controller board for sensing the positions of UPS power switches and for sensing any overtemperature conditions.

A) ITF3-R2 Board Connectors

- CN1 : HF supply input
- CN2 : It is connected to CN8 of ADVS01 and goes on to CN3 of P3MC-R5 from CN7 of ADVS01.
- CN3 : It is connected to the Parallel Operation Controller Board (PARA04-CN3)
- CN4 : The following dry contact connections are on this socket:
  Pin1-Pin2 : Manuel bypass switch connection (for parallel units only)
  Pin3-Pin4 : UPS output switch aux. contact (NO)
  Pin5-Pin6 : Maintenance bypass switch aux. contact (NO)
  Pin7-Pin8 : Thermic contact (NC)
  Pin9-Pin10 : Fuse fault contact (NO)
- CN5 : It is connected to CN4 of RS330-R1 Serial Communication Board
- CN6 : The aux. contact of the battery fuse and the emergency shutdown inputs are connected to this socket as follows:
  Pin1 : Battery fuse (or circuit-breaker) trip output
  Pin2-Pin3 : Battery fuse (or circuit-breaker) aux. contact (NO)
  Pin4-Pin5 : Emergency shutdown (EPO) switch (NO)

- CN7 : The following dry contact connections of alarm relays are on this socket:
  Pin6 : NC (line failure relay)
  Pin7 : C ('')
  Pin8 : NO ('')
  Pin9 : NC (battery low relay)
  Pin10 : C (")
  Pin11 : NO (")
  Pin12 : NC (bypass relay)
  Pin13 : C ('')
  Pin14 : NO (")

B) ITF3-R2 Board Indicator Lamps

LD1 : Battery circuit breaker (if exists) trip output indicator
LD2 : Line failure alarm relay energized
LD3 : Load on bypass alarm relay energized
LD4 : Battery low alarm relay energized

C) ITF3-R2 Board ''jumper'' Positions

For normal online operation:

JP1 = JP2 = JP3 = JP4 = ''1'' (inserted or short circuited)
JP5 = ''0'' (open circuited)

For parallel operation:
JP1 = JP2 = JP3 = JP4 = JP5 = ''0'' (open circuited)

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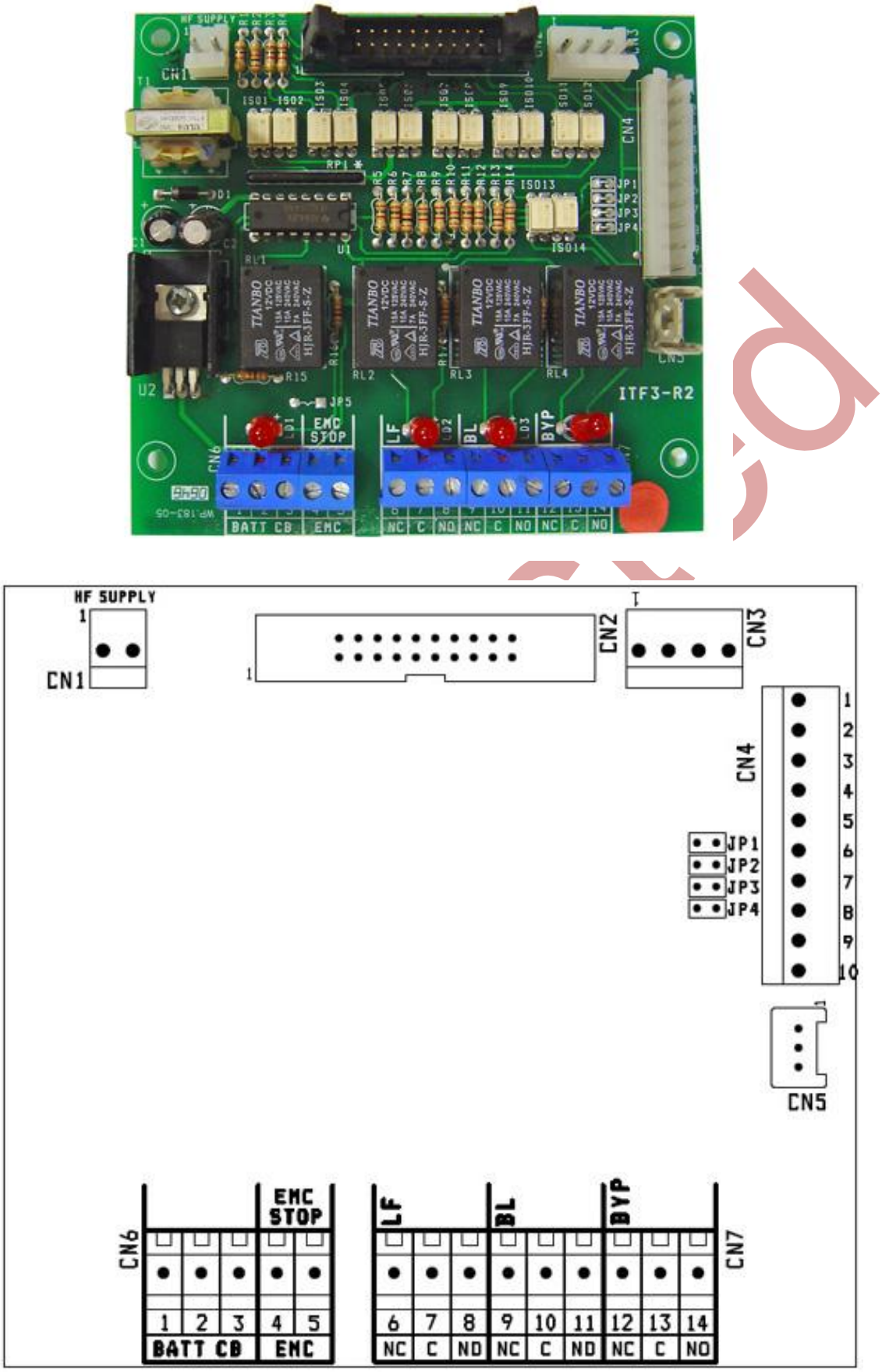

Figure 1.6.10 ITF3-R2 Board

1.5.9 STM01 OUTPUT MONITORING BOARD

This board monitors the UPS output voltages. It accepts the 3-Phase AC output voltages at the UPS output and generates a fault signal if there is a voltage or alternance loss in the outgoing sinusoidal waveforms.

A) STM01 Board Connectors

- CN1 : The 3-phase and Neutral of UPS output voltages (the output of the SCR switches) are connected to this socket. If any one of these voltages is too low (<160V AC) or has a high DC component (probably resulting from inverter damage, bad connection or SCR failure etc.) then a ''DC fault'' signal is produced on this board.

  CN1-1 : Neutral
  CN1-3 : UPS output T-phase
  CN1-5 : '' S-phase
  CN1-7 : '' R-phase

- CN2 : When a ''DC fault'' signal is produced, it is available on this socket. This is indicated by LD1 (yellow LED). CN2 is connected to CN9 of ADVS01-R1 board and the fault signal is transferred to the main controller board (P3MC-R5) from ADVS01 board.
- CN3 : HF supply input
- CN4 : HF supply input

B) STM01 Board Test Points

- TP12 : +12V DC(+/-0.5V)
- TP : VREF1 = 7.7V DC (+/-0.2V)
- TP : VREF2 = 6.7V DC ('')

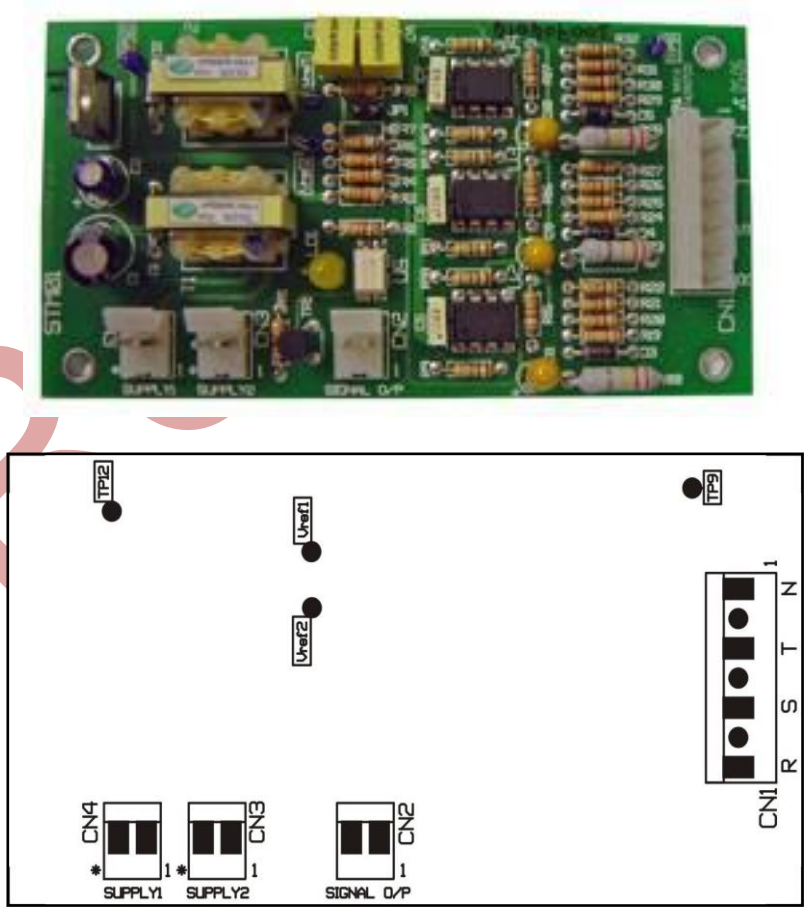

Figure 1.6.11 STM01 Board

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1.5.10 OPS3-R1 3 PH VOLTAGE AND CURRENT SAMPLE BOARD

This board accepts IGBT rectifier input voltage and current samples and sends to the main controller board for measurement purposes.

A) Basic Functions of OPS3 Board

1. IGBT rectifier AC input voltages (phase-neutral) are connected to CN1. These voltages are stepped down to a suitable level by the transformers T1, T2, T3 and then sent to the main controller board P3MC-R5 through CN7 of the OPS3 board.

   CN1-1 : Neutral
   CN1-3 : Rectifier input R-phase (220-230V AC to T3 through the fuse F3)
   CN1-5 : '' '' S-phase ('' T2 '' F2)
   CN1-7 : '' '' T-phase ('' T1 '' F1)

2. The outputs of the rectifier input current transformers are connected to CN2, CN3 and CN5. The current samples are sent to the main controller board P3MC-R5 again through CN7 of OPS3 board.

   CN2 : R-phase input current sample
   CN3 : S-phase '' '' ''
   CN5 : T-phase '' '' ''

3. It takes the low voltage bypass samples from ADVS01 board through its CN8 socket and generates a fast ''bypass or line failure signal'' for ECOMODE operation. This signal is sent to P3MC-R5 board via CN7 of OPS3.

4. HF supply signal is connected to CN4 of OPS3 board and used to produce +/- 12V DC supply voltages for the operation of the board.

B) OPS3 Board Test Points

-TP1 : Rectifier input T-phase (220-230VAC)
-TP2 : '' '' S-phase ''
-TP3 : '' '' R-phase ''
-TP4 : Neutral
-TP5 : -12V DC (+/-1.0V)
-TP6 : +12V DC (+/-0.5V)
-TP7 : VREF1
-TP8 : GND

C) OPS3 Board ''jumper'' Positions

JP1-1 = ''0'' (open circuited)
JP1-2 = ''1'' (short circuited)
JP3 = ''0'' (normally open, shorted only for 110-120VAC output units)

D) OPS3 Board Fuses

F1 : Rectifier input sample T-Phase (315mA)
F2 : '' '' '' S-Phase ('')
F3 : '' '' '' R-Phase ('')

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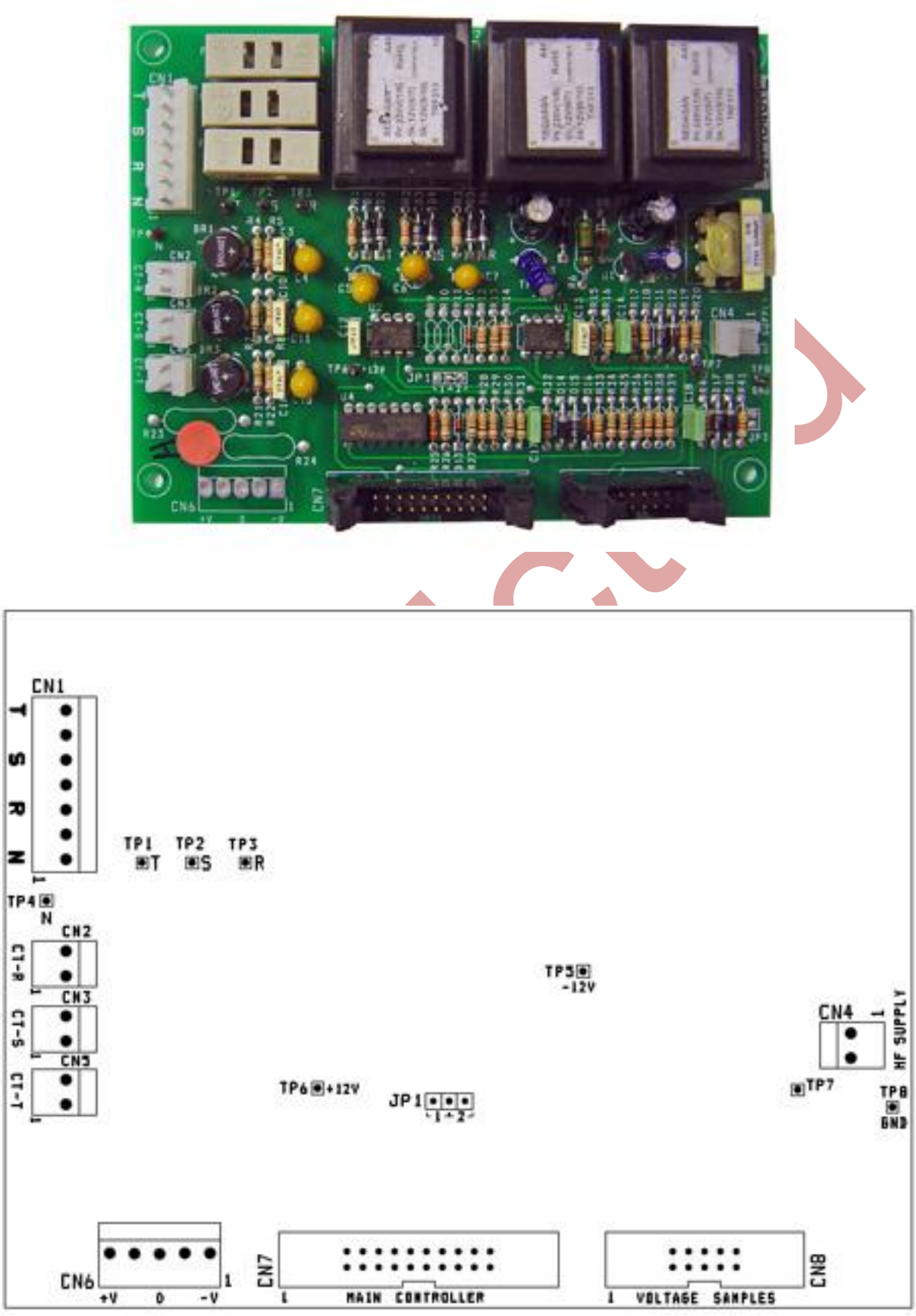

Figure 1.6.12 OPS3 Board

1.5.11 IGD3P IGBT Driver Board

Power supply and IGBT drivers are located on this board. There is an undervoltage circuit at the output of power supply this circuit measures the DC BUS voltage. If the DC bus voltage is lower then 250 volts undervoltage relay turns off the power supply output.

IGD3P board - Function of connectors

- CN1 : DC bus input
- CN2 : IGBT drive signal
- CN3 : IGBT drive signal
- CN4 : IGBT drive signal
- CN5 : IGBT drive signal
- CN6 : IGBT drive signal
- CN7 : IGBT drive signal
- CN8 : Main controller board connection
- CN9 : Power supply output
- CN10 : Power supply output
- CN11 : Power supply output
- CN12 : Power supply output
- CN13 : Optional current sensor input
- CN14 : Optional mains supply input

IGD3P board - Adjustments

- VR1 : Power supply output voltage adjustment

How to adjust power supply output

Set up a voltmeter to the IGBT drive supply (VEE1 to VCC1)
Adjust voltage to 15.5 volt by VR1
See the voltage on R46 app. 24 volt DC

IGD3P board - Additional test points :
VEE1-VCC1 : 15 volt DC
VEE2-VCC2 : 15 volt DC
VEE3-VCC3 : 15 volt DC
VEE4-VCC4 : 15 volt DC
VEE5-VCC5 : 15 volt DC
VEE6-VCC6 : 15 volt DC
ZD25 : 15 volt DC

IGD3P board - Functions of lamps

- LD1 : If there is voltage at DC BUS upper than 100 volt this lamp lits
- LD2 : If undervoltage circuits turns on the power supply output this lamp lits (DC BUS voltage is higher than 250 volts)

IGD3P board - Function of jumpers :

- JP1 : IGBT failure signal way test jumper,if this jumper is connected an IGBT failure alarm occurs so alarm simulation can be made by this way.

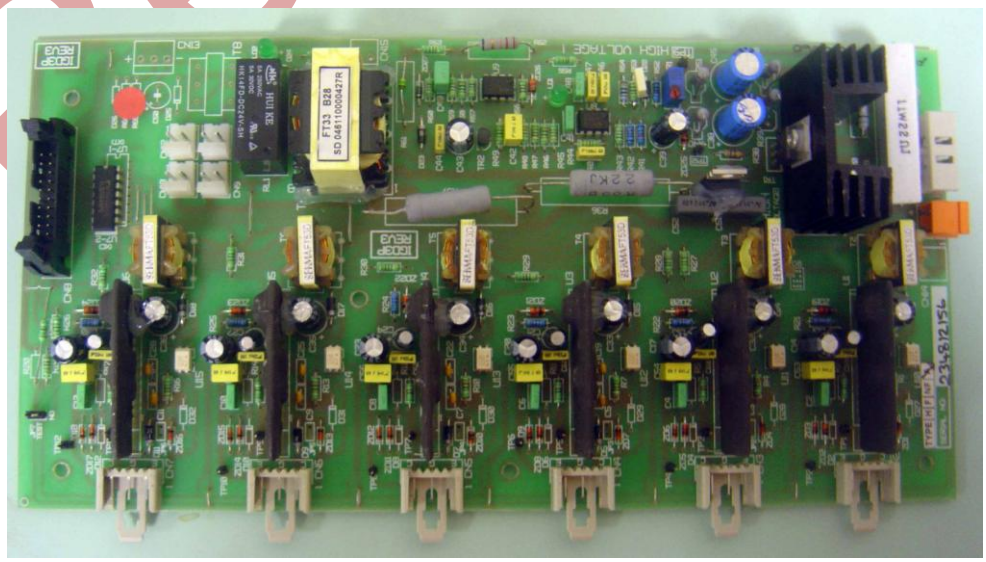

Figure 1.6.13 IGD3P Board

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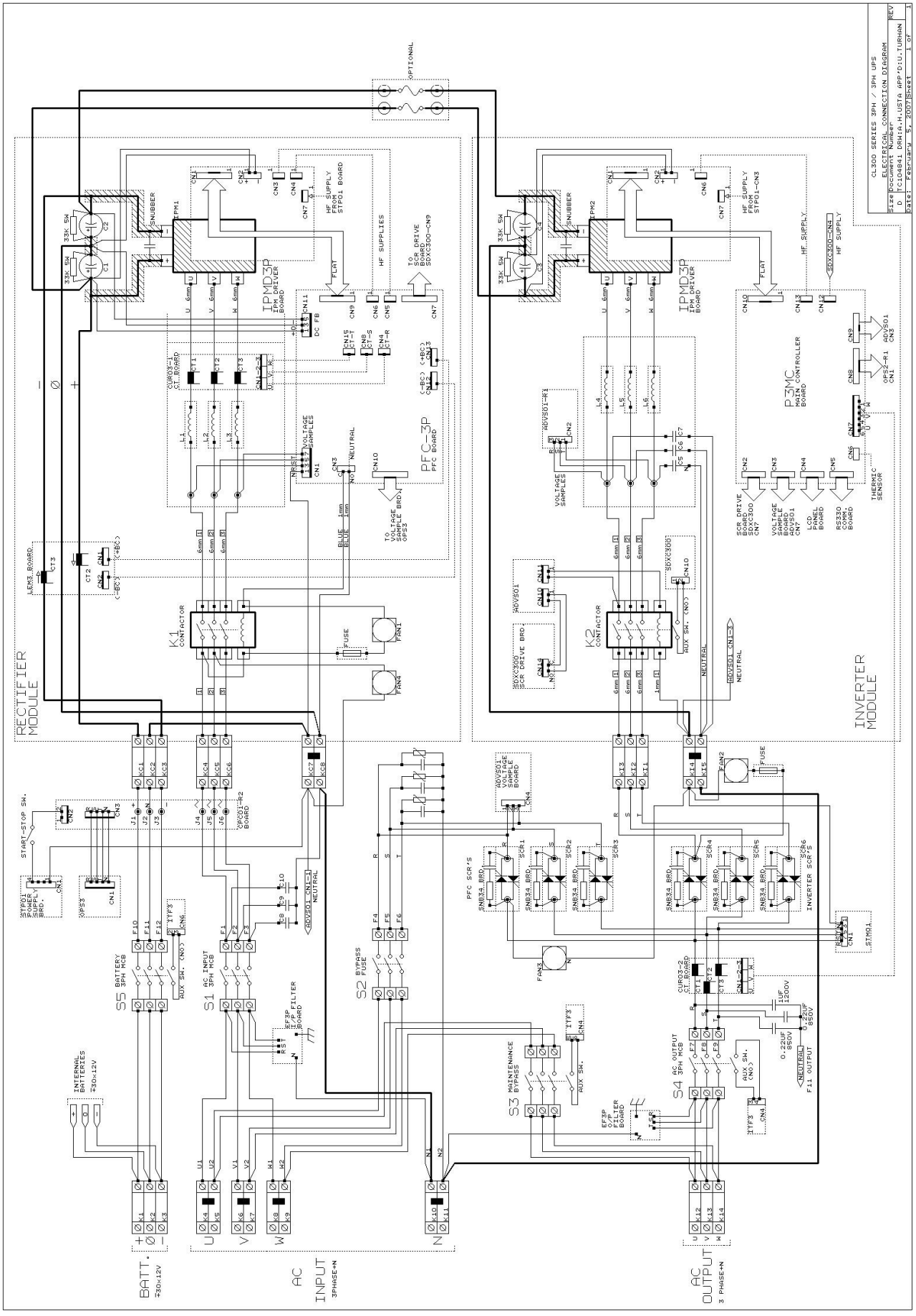
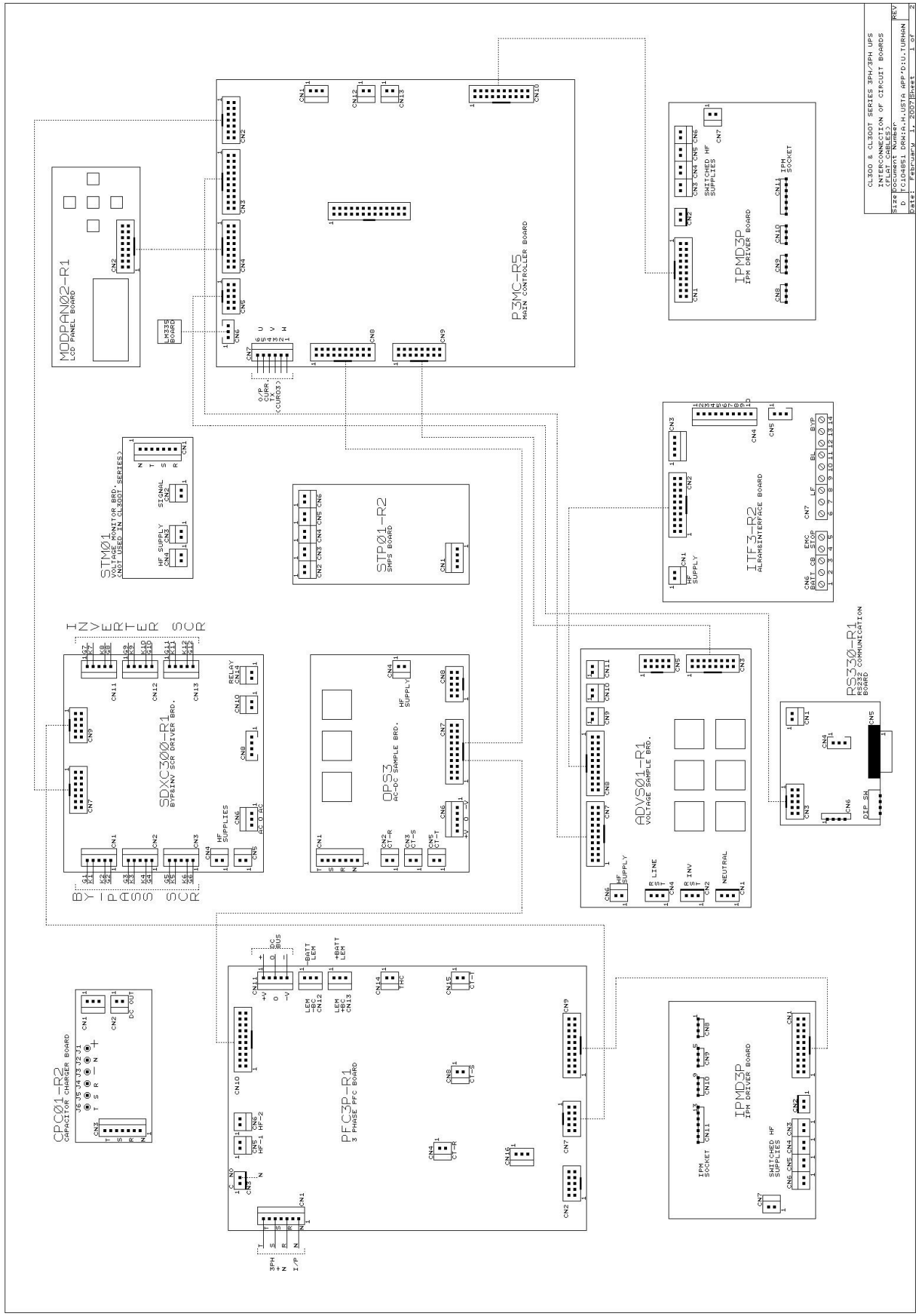
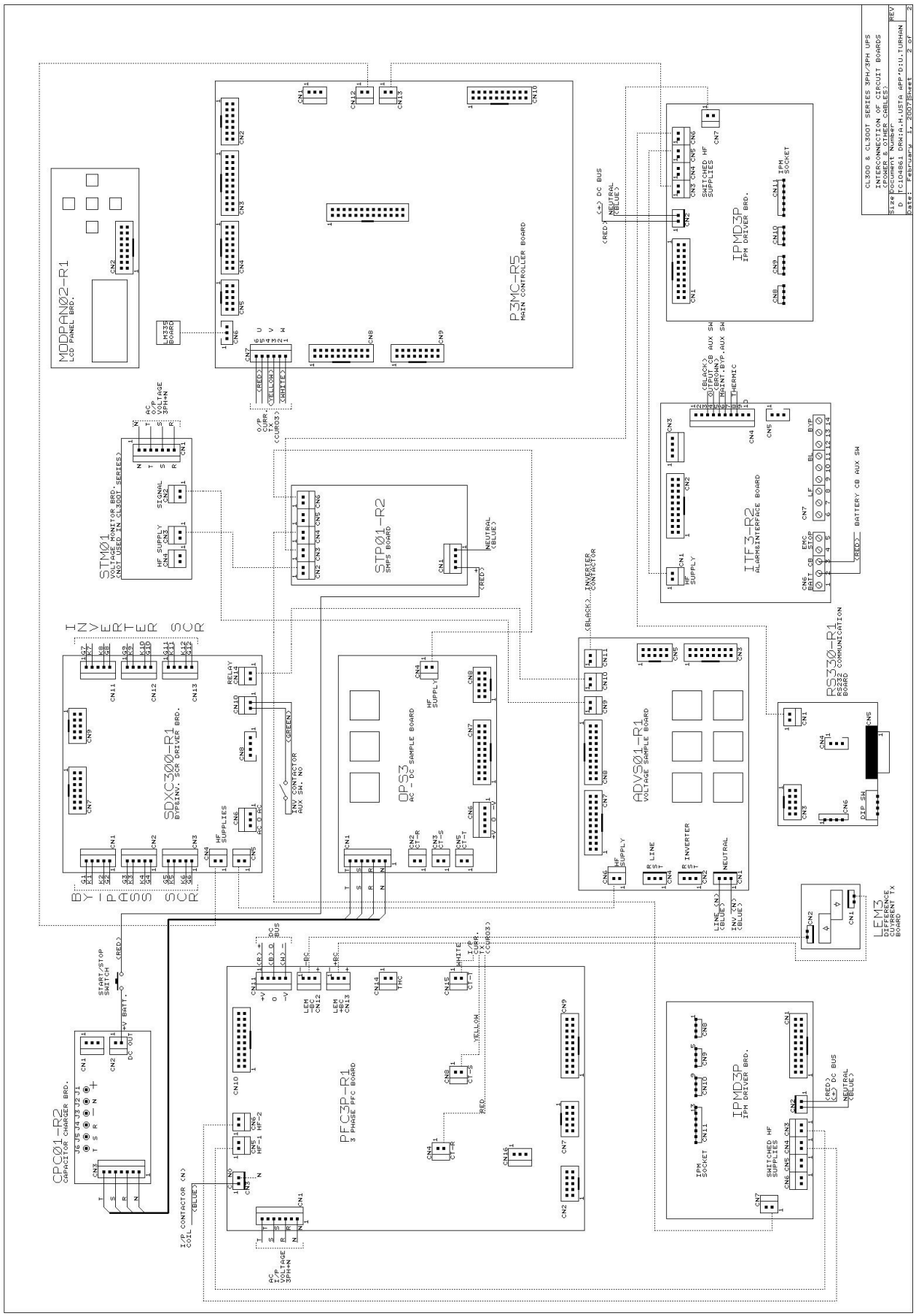


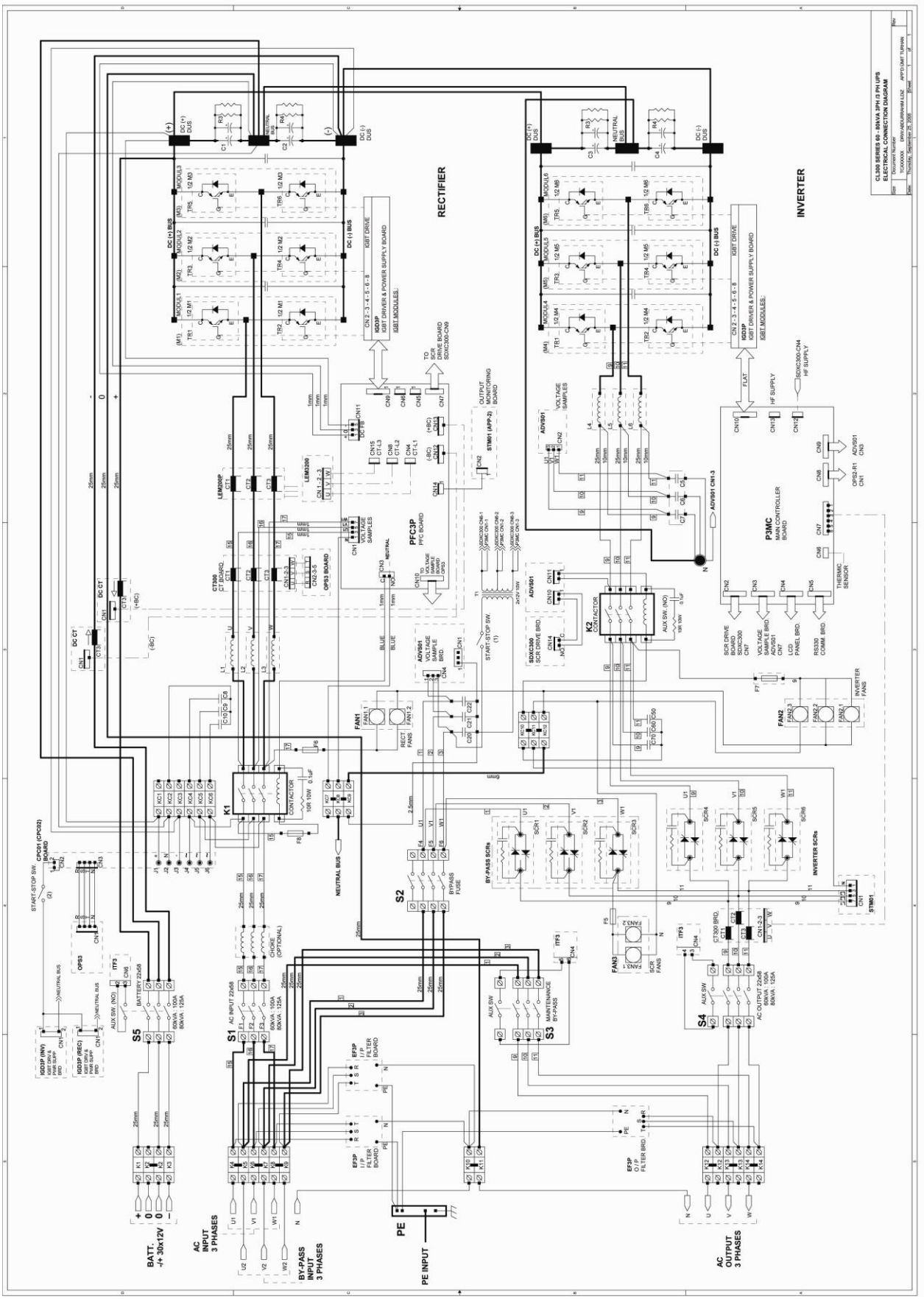
ELECTRICAL CONNECTION DIAGRAM (10-15-20-30-40 kVA)



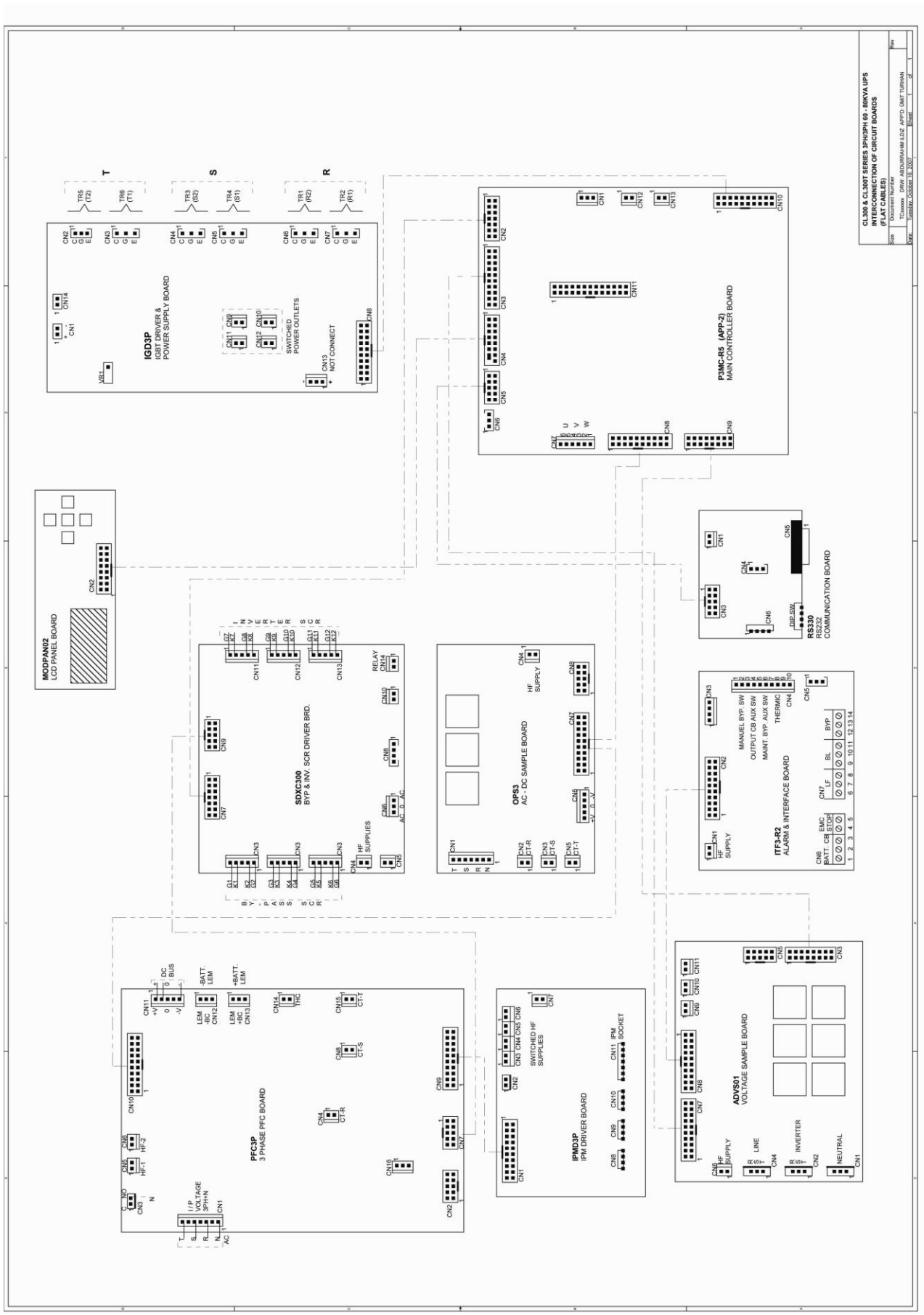
INTERCONNECTION OF CIRCUIT BOARDS (FLAT CABLES) (10-15-20-30-40 kVA)



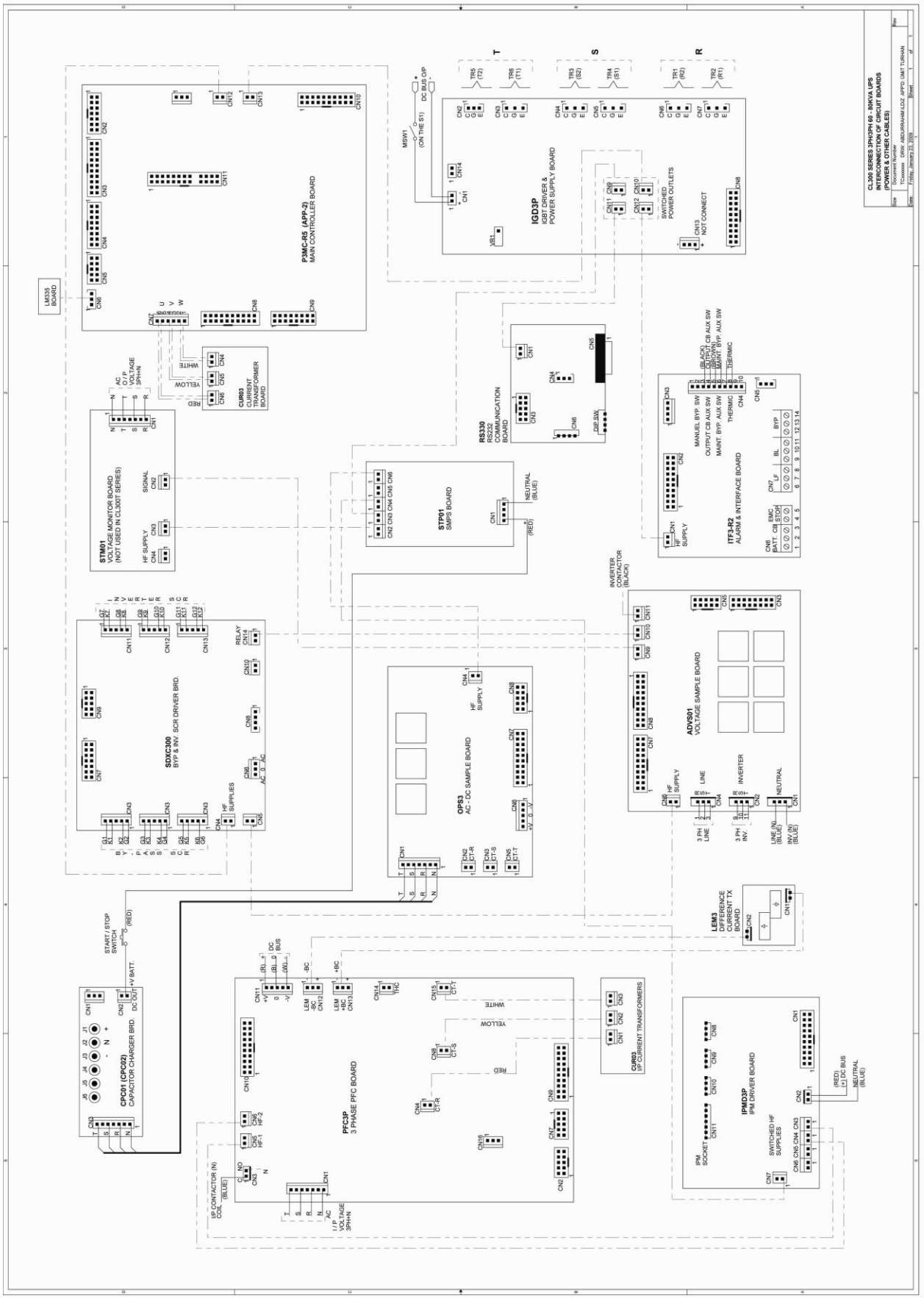
INTERCONNECTION OF CIRCUIT BOARDS (POWER & OTHER CABLES) (10-15-20-30-40 kVA)



ELECTRICAL CONNECTION DIAGRAM (60-80 kVA)



INTERCONNECTION OF CIRCUIT BOARDS (FLAT CABLES) (60-80 kVA)



INTERCONNECTION OF CIRCUIT BOARDS (POWER & OTHER CABLES) (60-80 kVA)

II. UPS INSTALLATION

2.1 Introduction

WARNING!!!

- Do not apply electrical power to the UPS equipment before the arrival of authorized service personnel.
- **The UPS equipment should be installed only by qualified service personnel.**
- The connection of the batteries and the maintenance should be done by qualified service personnel.
- Do not make any short- circuit to the battery poles. Because of high voltage and high short-circuit current, there is risk of electrical shock or burn.
- Eye protection should be worn to prevent injury from accidental electrical arcs. Remove rings, watches and all metal objects. Only use tools with insulated handles. Wear rubber gloves.

This chapter contains location installation information of the UPS and the batteries. All the establishments have their own specialties and needs. So in this part, the installation procedure is not being explained step by step. Instead, general procedure and the applications are explained for the technical personnel.

2.2 Unpacking

The UPS is packed and enclosed in a structural cardboard carton to protect it from damage.

1) **Inspect for damage that may have occurred during the shipment If any damage is noted, call the shipper immediately and retain the shipping carton and the UPS.**
2) Carefully open the carton and take the UPS out.
3) Retain the carton and packing material for future use.

Unit package contents:

1) A user manual and Guarantee certificate.
2) Battery cabinet and/or shelf (Optional)
3) Battery connection cables.

2.3 Equipment Positioning

1. The equipment's installation place must be an easy serving place.
2. Install the UPS in a protected area with adequate air flow and free of excessive dust.
3. You must therefore allow for a minimum gap of 250 mm behind the unit to allow adequate air flow
4. Select a suitable place (temperature between 0°C and 40°C) and the relative humidity (%90 max)
5. It is recommended to place the equipment in an air-conditioned the room (24°C)
6. Temperature is a major factor in determining the battery life and capacity. Keep batteries away from main heat sources or main air inlets etc.
7. In case of an operating the UPS in a dusty place, clean the air with a suitable air filtration system.
8. Keep out of your equipment from explosive and flammable items.
9. Avoid direct sunlight, rain, and high humidity.

WARNING!!! Check the capacity of the forklift if it is available for lifting.
DO NOT LEAN OR LIFT THE UPS CABINET AFTER THE BATTERIES HAVE BEEN INSTALLED.

2.4 Connecting the UPS Power Cables

WARNING!!! A separate power line should be used to supply the UPS AC input. Never use the same line to supply another electrical device. Do not use any additional cable to increase the length of the UPS's input cable. It is advised to use an MCCB suitable for the input current on the UPS's input line.

The connection of the electrical panel should be supplied by a grounded outlet.
Otherwise, the UPS and the load connected to the output will be left ungrounded. The grounding system must be checked, and must be strengthen if required. Potential difference between ground and neutral must be less than 3V AC.

Descriptions of the UPS input output cable connection terminals are shown in figure 2.1

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Recommended input line cable and fuse ratings are given in the table below.

UPS RATING (KVA)	Recommended cable size (mm^2)				
	AC INPUT	Bypass INPUT / AC OUTPUT	External Battery INPUT	AC Input /AC Output Cable Terminals U-V-W-N	Battery Terminals + & -
10	6	6	6	16 mm^2	16 mm^2
15	10	10	10	16 mm^2	16 mm^2
20	10	10	10	16 mm^2	16 mm^2
30	16	16	16	35 mm^2	35 mm^2
40	16	16	16	35 mm^2	35 mm^2
60	25	25	25	35 mm2	35 mm2
80	35	35	35	35 mm2	35 mm2

NOTES: The neutral conductor should be sized for 1,5 times the output/bypass phase current. These recommendations are for guideline purposes only and are superceded by local regulations and codes of practice.

2.4.1 Safety Earth

The safety earth cable must be connected to the earth BUS BAR and bonded to each cabinets in the system and also the earthing and neutral bonding arrangements must be in accordance with the local laws.

ATTENTION!!! Failure to follow adequate earthing procedures can result in electric shock hazard to personnel, or the risk of fire.

2.4.2 Cable connection procedure

WARNING!!! All connections of the UPS must be done by qualified service personnel

After positioning the UPS, the cables must be connected as described below:

1. Verify all switches and fuses in front of the UPS are at **"0"** position. (OFF)
2. Connect the 3 phase AC input coming from the mains distribution panel to the AC input terminals as shown on the label. (Figure 2.1)

ATTENTION!!!: ENSURE CORRECT PHASE SEQUENCE.
If there is a phase sequence error, UPS doesn't transfer the load to INVERTER output. If you can't see SYNC:OK in the INFORMATION MENU on LCD, then change the input phase sequence.

3. Connect the output of the UPS to the load distribution panel.
4. Connect the battery groups. Refer to battery installation section.

WARNING :
- **CHECK BOTH OF THE BATTERY GROUPS FOR CORRECT POLARITY AND VOLTAGE**
- **DO NOT TURN ON THE BATTERY SWITCH (F5) BEFORE STARTING THE UPS**

5. Connect the copper earth bus, to the safety earth of the mains distribution panel.

NOTE : The earth and the neutral connections must be in accordance with the local rules.

WARNING: Note that the Input Neutral (N1) MUST also be connected to K10 terminal

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2.4.3 Description of connection terminals of the UPS :

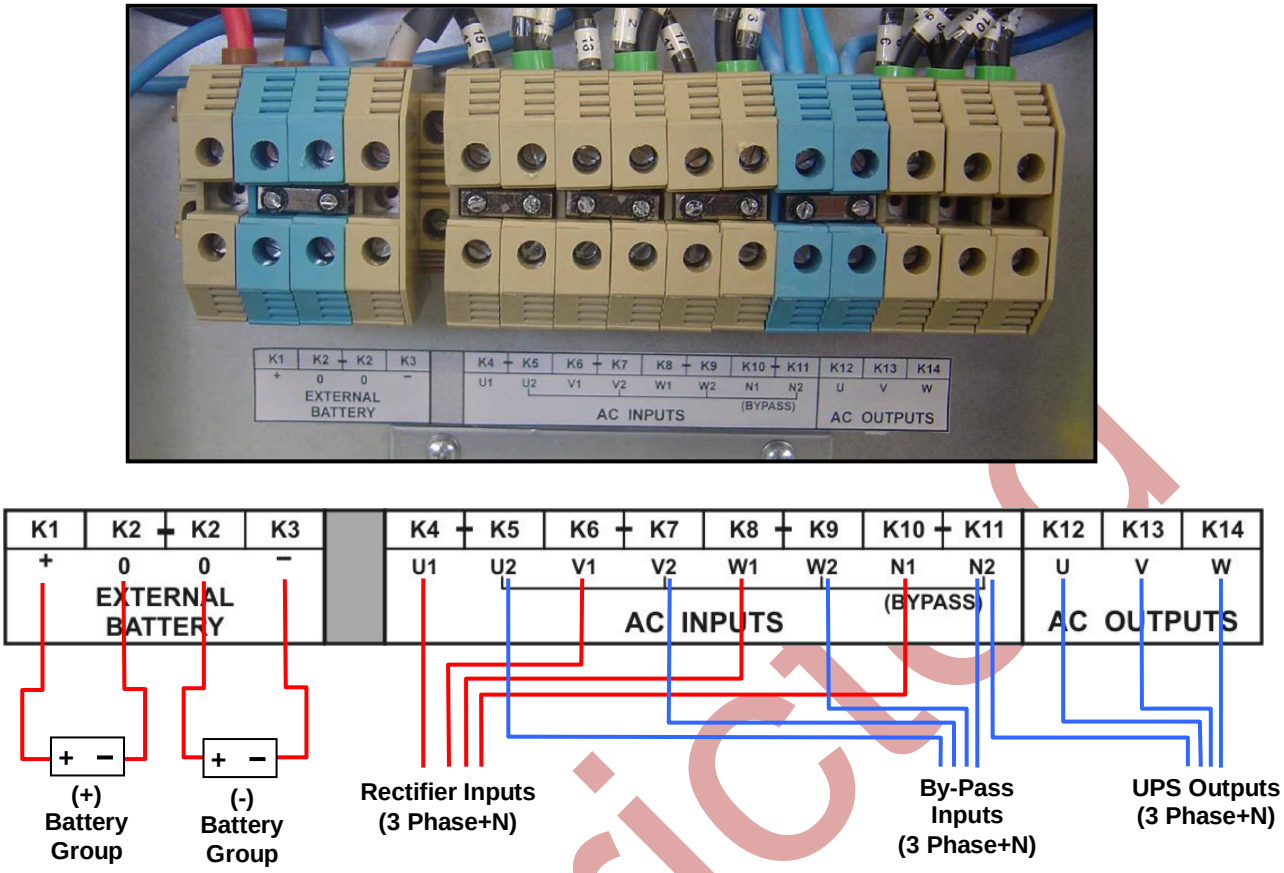

K1 K2 K2 K3
+ 0 0 −
EXTERNAL BATTERY
K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14
U1 U2 V1 V2 W1 W2 N1 N2 U V W
AC INPUTS
(BYPASS)
AC OUTPUTS
(+) Battery Group
(-) Battery Group
Rectifier Inputs (3 Phase+N)
By-Pass Inputs (3 Phase+N)
UPS Outputs (3 Phase+N)

Figure 2.1 10-15-20 kVA Cable Connections

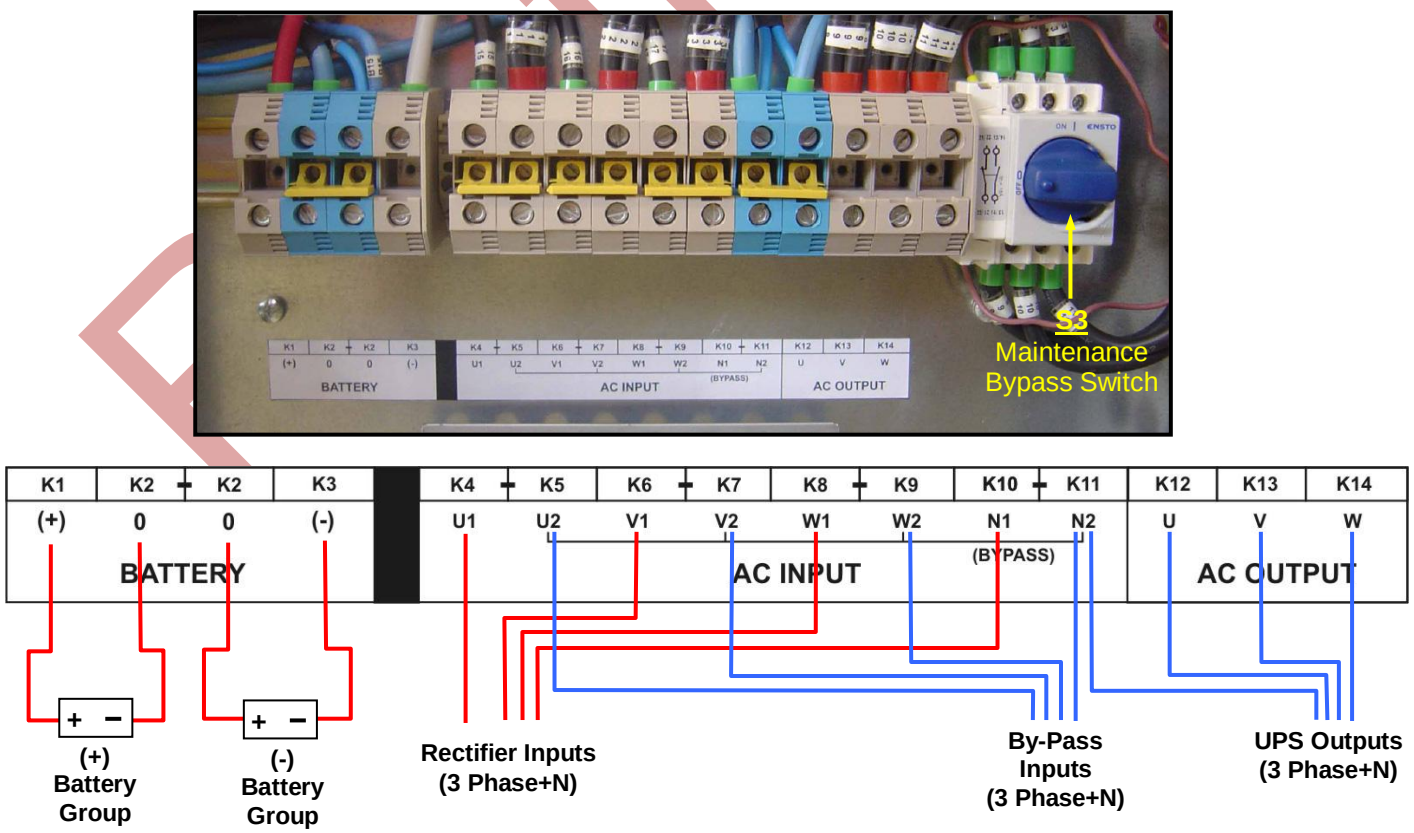


Figure 2.2 30-40 kVA Cable Connections

Electrical

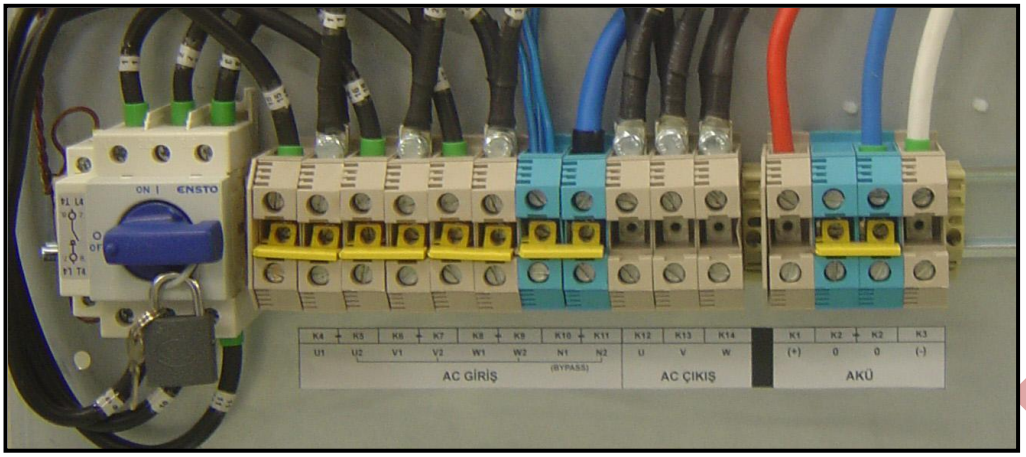
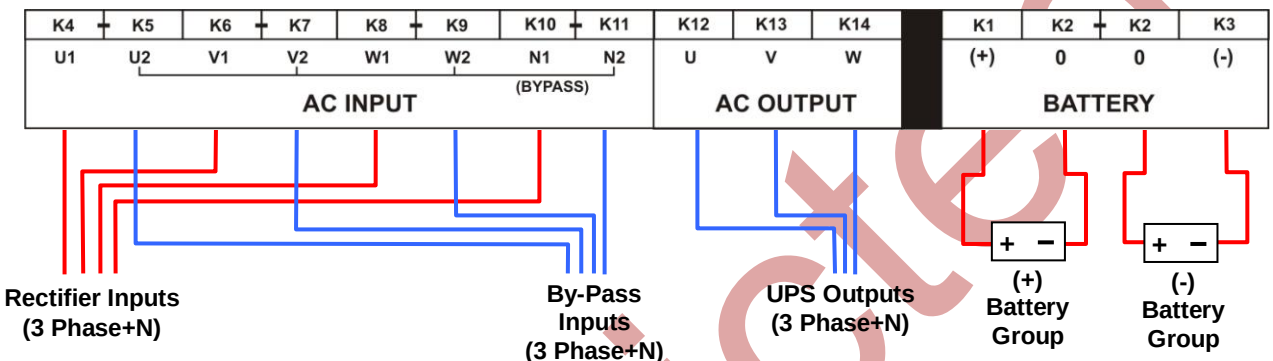
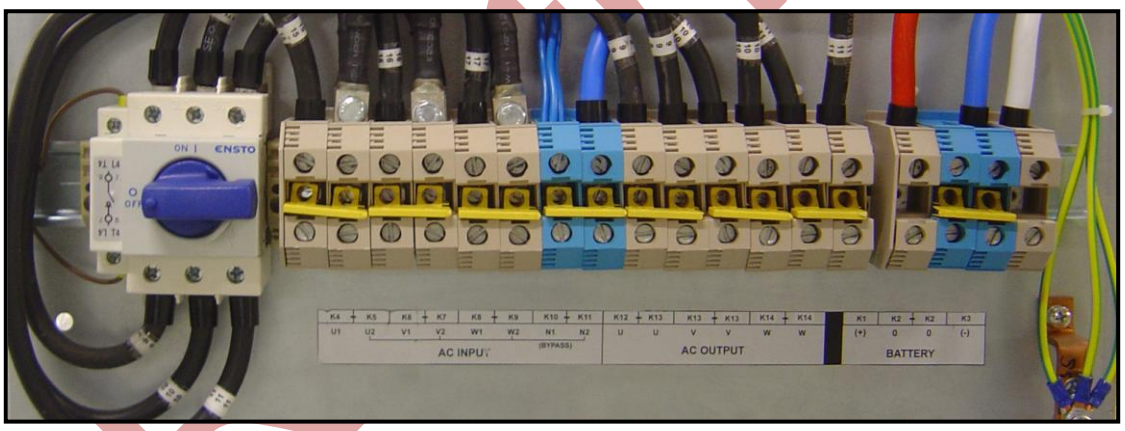


Figure 2.3

60 kVA
Cable Connections





Rectifier Inputs (3 Phase+N)

By-Pass Inputs (3 Phase+N)

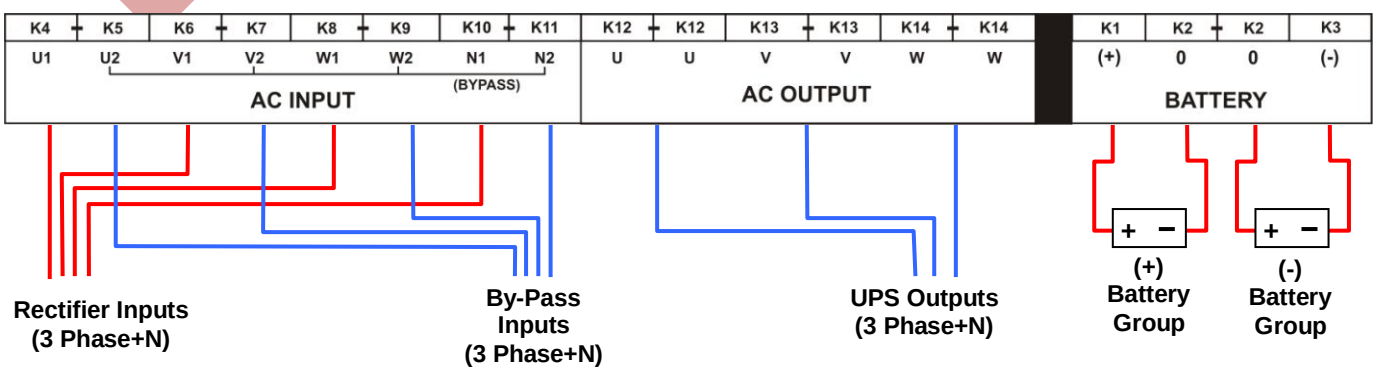
UPS Outputs (3 Phase+N)

(+) Battery Group

(-) Battery Group

Figure 2.4

80 kVA
Cable Connections



Rectifier Inputs (3 Phase+N)

By-Pass Inputs (3 Phase+N)

UPS Outputs (3 Phase+N)

(+) Battery Group

(-) Battery Group

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- As shown on the power connection label of the UPS, U1, V1 and W1 phase of the incoming 3 phase supply are used as the bypass inputs under normal conditions, if there is not a separate bypass supply (split bypass).

- If there is a separate 3- phase AC supply for bypass (Split Bypass):

a-) Remove the links between K4 - K5, K6 - K7 and K8 - K9.

b-) Connect the phases of the bypass source U2, V2 and W2 to K5, K7 and K9 respectively.

c-) Connect the Neutral (N2) of the Bypass source to K11.

Note that the Neutral of the 3 phase input supply (N1) and the Neutral of the 3-phase bypass supply (N2) must always be connected together to form the Neutral of the AC output.

2.4.4 Battery Installation

WARNING!!! Be careful while connecting batteries.

ATTENTION!!! Open the battery switch/fuse before making any connection on the batteries.

The batteries associated with the UPS equipment are usually contained in a purpose-built battery cabinet. In CL-300P Series 10-15 and 20 KVA UPSs, there is enough space for 60 pieces of 12V 7Ah maintenance free batteries, and in 30 and 40 KVA UPSs, there is enough space for 120 pieces of 12V 7Ah batteries.

Where battery racks are used, they should be sited and assembled in accordance with the battery manufacturer's recommendations. In general, batteries require a well-ventilated, clean and dry environment at reasonable temperatures to obtain efficient battery operation.

In general a minimum space of 10 mm must be left on all vertical sides of the battery block. A minimum clearance of 20 mm should be allowed between the cell surface and any walls. All metal racks and cabinets must be earthed.

1. Unpack each battery and check its terminal voltage. Any battery with terminal voltage less than 10,5V must be charged before installation.

2. Please check the battery connecting hardware and documents. (cables, trays, connection diagrams)

3. Please locate suitable number of batteries on each rack, according to the battery installation and connection diagram given with the unit.

4. Start locating the batteries from top to the bottom on the racks.

5. Be careful about the connection between the racks and polarities.

6. After interconnecting the batteries, connect "+", "0" and "-" leads of the batteries to the battery input terminals on the UPS. Be careful to connect the batteries correctly and do not turn on (S5) before checking all connections and before starting the UPS. In CL-300P Series UPS, 60 blocks of batteries are connected in series, in such a way that they form two strings of batteries with opposite polarity; with a center tap connection to the NEUTRAL (N1-N2) internally.

NOTE THAT SEPARATE CABLES FROM EACH BATTERY GROUP SHOULD BE CONNECTED TO K2 TERMINALS TO FORM THE MIDPOINT CONNECTION.

WARNING!!! NEVER TURN ON S5 (BATTERY FUSE) WITHOUT CENTER POINT CONNECTION TO K2.

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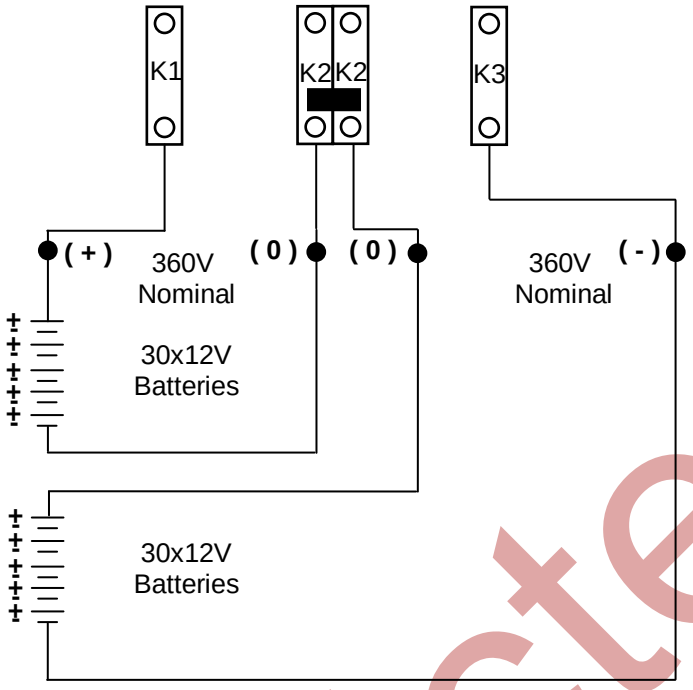

Figure 2.3 External Battery Connections (60x12V)

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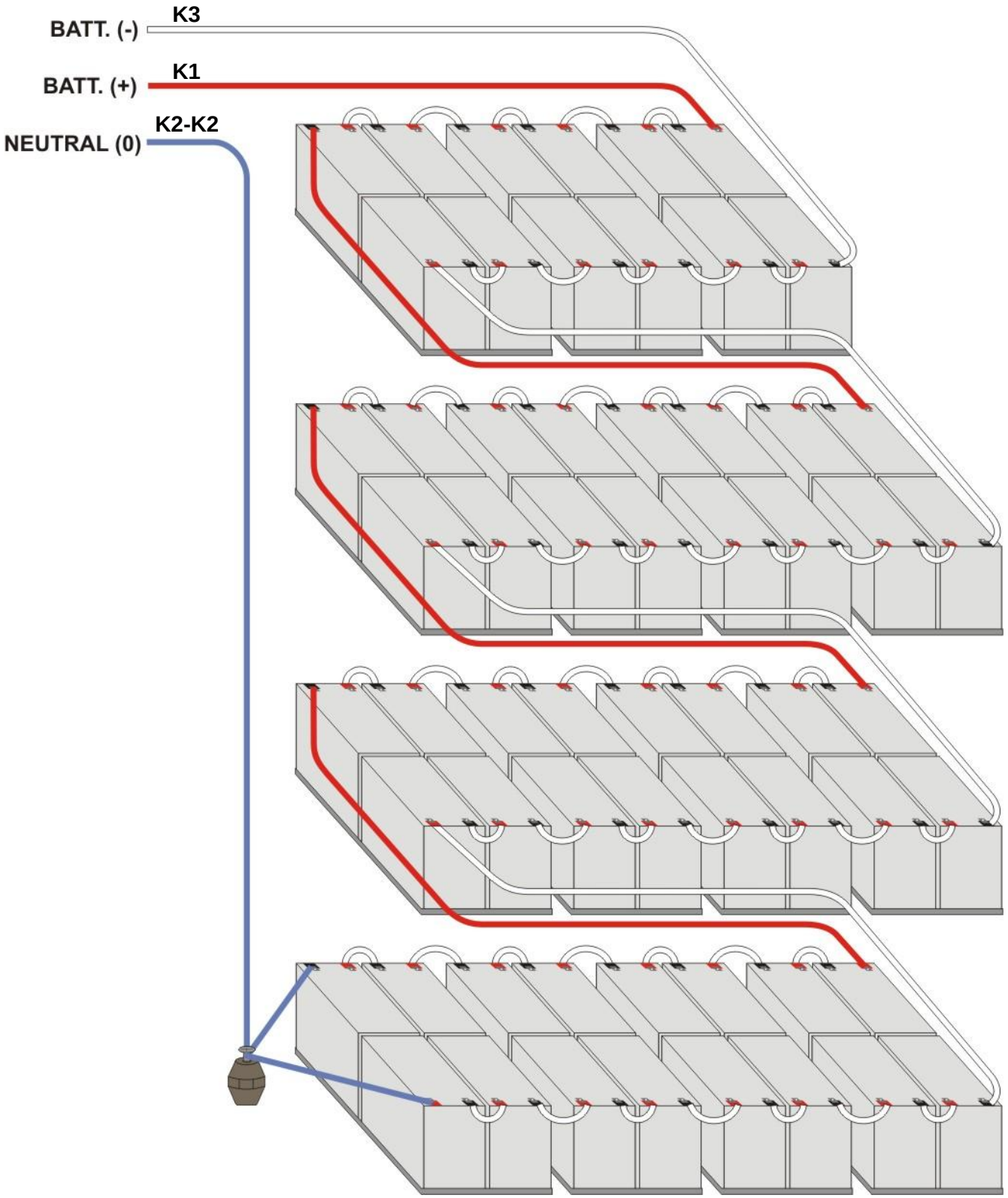

Figure 2.3 CL300P, 10-15-20 KVA Internal Battery Connections (2x30=60x12V 7Ah)

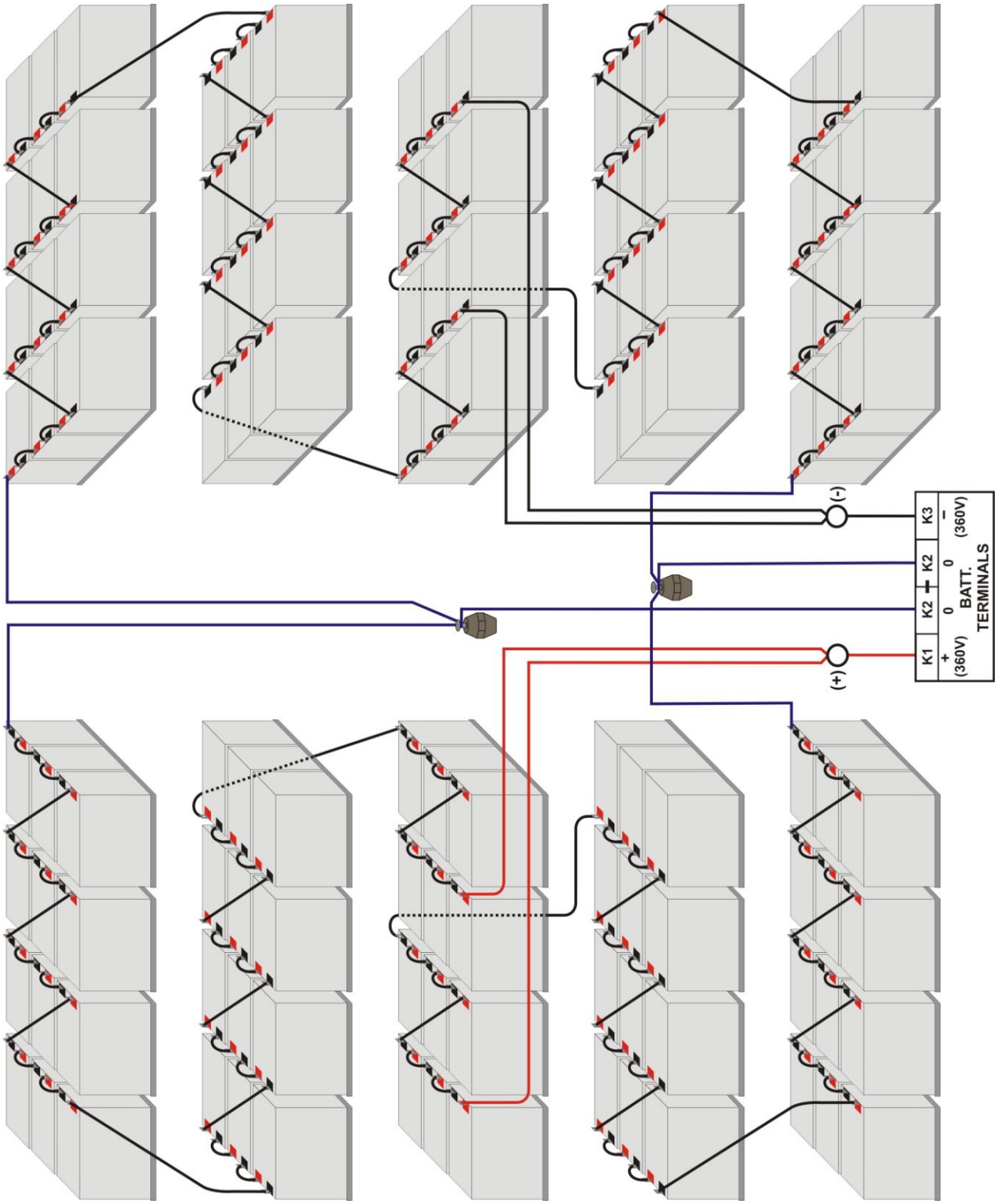

Figure 2.4 CL300P, 30-40 KVA Internal Battery Connections (2x60 pcs. 12V 7Ah)
(Two dual polarity battery groups in parallel)

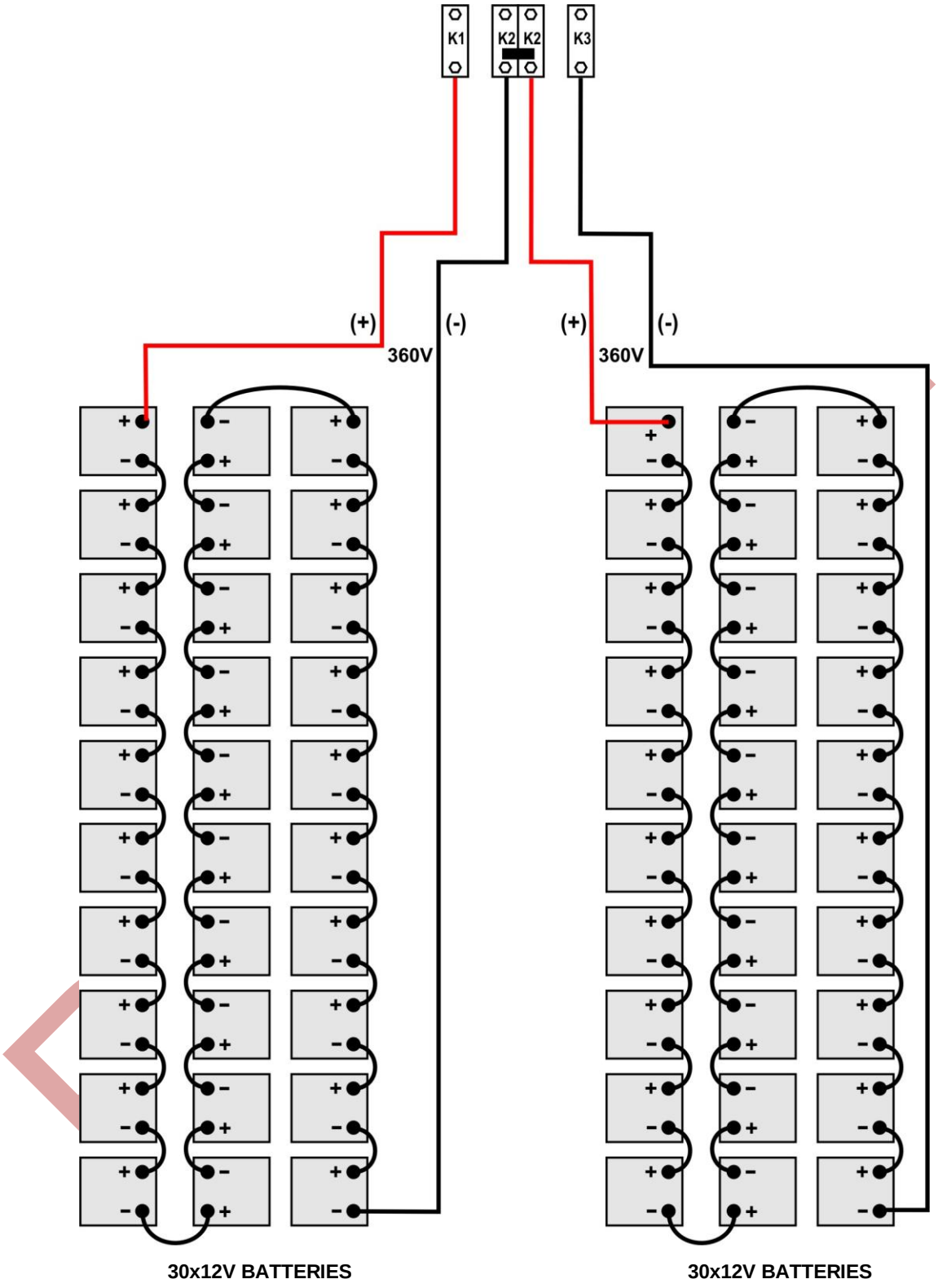

Figure 2.5 CL300P 60-80 Kva Battery Connections

III. FRONT PANEL

3.1 Introduction

The front panel of UPS, consisting of a 2 lines alphanumeric display, 7 status lamps, plus 5 function keys, allows the complete monitoring of the UPS status. The mimic flow diagram helps to comprehend the operating status of the UPS. By using the function keys operator can moves on menus and change some parameters.

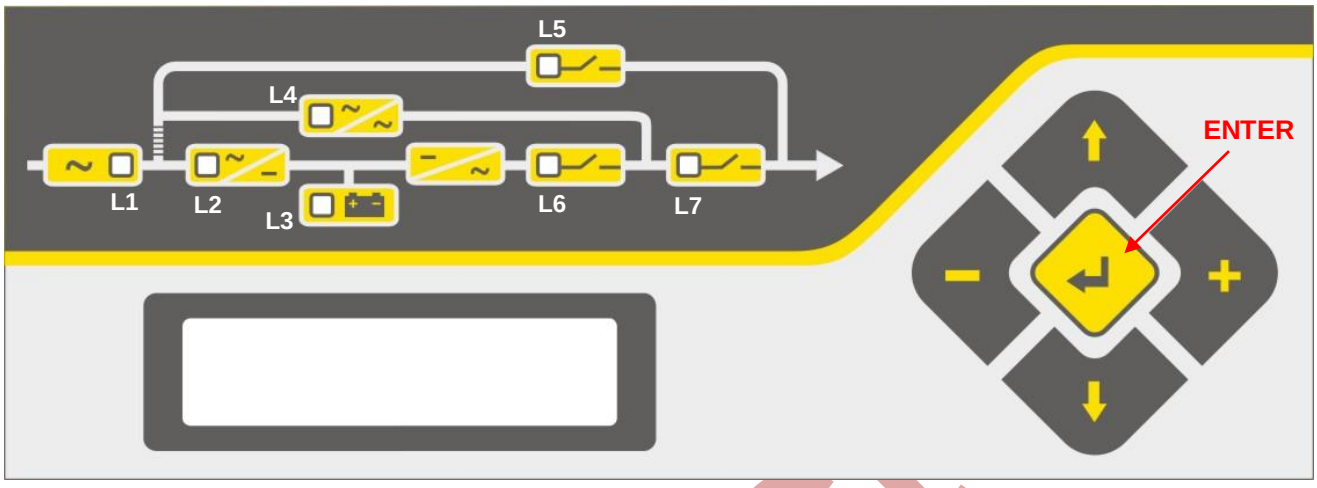

Figure 3. Operator control and indicator panel

L1 : If lamp is lit mains is okay
L2 : If lamp is lit the rectifier is operating
L3 : If lamp is lit UPS is operating on batteries
L4 : If lamp is lit static bypass is active and load is supplied by the bypass source.
L5 : If lamp is lit mechanical bypass switch is on
L6 : If lamp is lit inverter supplies the load
L7 : If lamp is lit the output switch is “ON”.

There are 5 function keys on front panel. These are ENTER **(↵)**, UP **(↑)**, DOWN **(↓)**, PLUS **(+)** and MINUS **(-)**.UP and DOWN keys help moving on menus, PLUS and MINUS keys select options, ENTER key means the selected option or menu is valid.

3.2 Front Panel Menu Descriptions

By using the buttons on the front panel, you can move on main menu functions. You can enter the submenus of the item seen on the LCD panel (MEASURES, ALARMS, INFORMATION etc.) and navigate within it by using (↓), (↑) and ENTER keys.

The Main Menu items are listed below. You can choose any requested menu using (↑) and (↓) keys. By pressing ENTER key, you can choose that menu and you can reach all submenu items using (↑) and (↓) keys again. At the end of submenus of each MENU, an <ENTER> EXIT message is seen, and if you press ENTER, you exit from the selected menu and go back to the beginning of the Main Menu.

Main Menu items	**Function**
STATUS MENU	The status message which shows the UPS status
MEASURES MENU	→ Enter "go to Meausures submenu"
ALARMS MENU	→ Enter "go to Alarms submenu"
INFORMATION MENU	→ Enter "go to İnformation submenu"
ADJUST MENU	→ Enter "go to adjust submenu"
OPTIONS MENU	→ Enter “go to options submenu”
COMMAND MENU	→ Enter “go to Command submenu”
TIME MENU	→ Enter “go to Time and date submenu”
SERVICE MENU	→ Enter “go to service submenu”
Go to STATUS MENU	

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3.2.1 MEASURES Menu Items

In this menu you can see all measured values. Use (↑) and (↓) keys for moving on submenu items.

	Submenu item	Function
1	**LD%: 060 074 080**	Output load percentage
2	**OPV: 220 221 220**	Output voltages
3	**FREQU: 50.0 Hz**	Output frequency
4	**IPV: 240 235 220**	Input voltages
5	**BYP: 230 232 231**	Bypass source voltages
6	**IPI: 022 010 030**	Input currents (amperes)
7	**+BATT: 405 V 000 A**	"+" Battery voltage and charge / discharge current
	-BATT: 405 V 000 A	"-" Battery voltage and charge / discharge current
8	**TEMP: 030 c**	Cabinet inside temperature
9	**BATT.CAPACI:068%**	Battery charge level
10	**ENTER <EXIT>**	→ Enter **(↵)** exit from menu
	Go to STATUS MENU	

3.2.2 ALARMS Menu Items

In this menu you can see recorded log events and valid alarms

	Submenu item	Function
1	**UPS STATUS**	Alarm status at that instant
2	**000>311201 23:15**	Monitoring past alarms : The first 3 digit number indicates the event number. 000 numbered event is the last event. Date ddmmyy time:hh:mm On the second line of LCD PANEL you can see al recorded alarms. Use PLUS and MINUS keys for moving on events.
3	**ENTER CLEAR LOG**	→ Enter **(↵)** clear log event records After you cleared events you see EMPTY LOG message.
4	**PARR.ERR.NR : 017**	Parallel control board fault number. (if the parallel board is installed) 0 means that there is no error on parallel board
5	**ENTER <EXIT>**	→ Enter **(↵)** exit from submenu
	Go to STATUS MENU	

3.2.3 INFORMATION Menu Items

This menu gives information about the UPS.

	Submenu item	Function
1	**SYNC :OK COMM :OK**	If the UPS is operating in syncron to mains SYNC:OK ,if not syncron SYNC:-- If communication is active COMM:OK ,if not active COMM:--
2	**POWER: 20000 VA**	The maximum power rating of the UPS
3	**VERSION : B12**	Shows the UPS control software version.
4	**FREQUENCY : PLL**	Frequency generation mode PLL :phase locked loop is generating the frequency SLAVE : in parallel system master is generating the frequency
5	**NOM.FRQ: 50 Hertz**	Nominal output frequency
6	**MODEL: CL310**	Model name of the UPS
7	**ENTER <EXIT>**	→ Enter **(↵)** exit from submenu
	Go to STATUS MENU	

Restricted

3.2.4 ADJUST Menu Items:

Only service personnel can use this menu ,the incorrect use of this menu can cause damage to the UPS.

	Submenu item	Function
1	**PASSWORD : XXX**	Service password input (-) key 100, UP key 10, (+) key 1 changes after you write the password on screen press ENTER key ,if the password is wrong the is no action. If the password is okay a beep sounds and you see ADJUST MODE at the second line.
2	**ENTER <EXIT>**	→ Enter **(↵)** exit from submenu
	Go to STATUS MENU	

3.2.5 OPTIONS Menu Items

In this menu the user can set some important parameters for UPS operation..

	Submenu item	Function
1	**MODE: ONLINE**	By using (+) and (-) keys you can move on 5 different operation modes. **ONLINE** : stand alone mode **PARALLEL** : 2 UPS in symmetric parallel operation **N+1 REDUNDANT** : 2 or more UPS in N+1 redundant parallel mode **REDUNDANT**: 2 UPS in redundant parallel mode. **ECONO:** Off-line mode. → press ENTER for 3 seconds and the selection is valid
2	**UPS No : 001**	By using PLUS and MINUS keys you can change number 0 to 3. In parallel operation select different number for each UPS. If you select the same number DUBL UPS NUMBER message tells the fault. → press ENTER for 3 seconds and the selection is valid
3	**REMOTE :ENABLE**	By using PLUS and MINUS keys you can change enable and disable options. **enable** : remote battery test, shutdown and bypass functions are enabled **disable** : these functions are disabled → press ENTER for 3 seconds and the selection is valid
4	**RESTART:ON/OFF**	By using PLUS and MINUS keys you can change on and off options. **ON**: during mains failure, at the and of battery discharge UPS shutdowns, and after mains is restored UPS starts again. (battery trip out is on every time) **OFF**: after mains restoration UPS doesn't start by itself again. (You must turn off and then turn on the UPS) (battery trip out is off) → press ENTER for 3 seconds and then the selection is valid
5	**RELAY:BATT.LOW /COMMON**	By using (+) key the function of the RL3 Relay on the interface board can be selected between Battery Low or Common Alarm.
6	**BATTERY TEST:ON/OFF**	By using PLUS and MINUS keys you can change on and off options. Used to enable or disable automatic battery test.
7	**ENTER <EXIT>**	→ Enter **(↵)** exit from submenu
	Go to STATUS MENU	

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3.2.6 COMMAND Menu Items

This menu is used to give various commands, to the UPS or to perform some tests on it. .

	Submenu items	Function
1	**SOUND : ON/OFF**	Used for turning on/off the audible alarm. If you press ENTER key the option will change (push ON, push OFF) If the OFF option is selected, audible alarm is turned off but in case of a new alarm, UPS changes the option to ON state.
2	**ENTER B.TEST>405**	If you press enter for 3 seconds battery test starts and lasts for 15 seconds. If battery test fails **A6 BATT FAULT** message is shown on panel and this message stays until you press ENTER key for 3 seconds. The value on the right indicates the battery voltage during battery test. Starting time of battery test is recorded to log event menu. If the test is performed successfully you can see only **BATTERY TEST** message on log records. If the test is unsuccessful a BATT.FAULT message will also be recorded. On the bottom line of LCD, BAT FAULT message will stay, and the user will be warned audibly every 15 seconds until this message is cleared by pressing the ENTER key for 3 seconds.
3	**ENTER <BYPASS>**	If you press ENTER key for 3 the load is transferred to bypass. If the load is on bypass, in this submenu you see **ENTER<INVERTER>** message at this position. If you press ENTER key for 3 seconds UPS transfers the load on inverter this time. In parallel modes this function is disabled and you see **BYP.FUNC.DISABLE** message on this submenu item.
4	**ENTER:MODEM INIT**	If you press ENTER key the connected modem of RS232 port is installed UPS sends AT command set to modem for installation. If the function is completed you must hear a beep sound. At the and of this function modem is ready to answer dial up connection.
5	**ENTER <BOOST>**	If you press ENTER key for 3 seconds boost charge starts. The given time for boost charge is 10 hours. At the end of this time UPS stops boost charging. If the boost charge is active this submenu item changes to **STOP BOOST> 005H** message. 005H indicating that boost charge has lasted for 5 hours. If the number is 10, boost charge stops. If you press ENTER key before this time boost charge stops immediately. Boost charge starting and boost charge end times are recorded in log event menu. If boost is active UPS beeps every 15 seconds
6	**SIMULATION OFF**	The purpose of this submenu is to check dry contact connections. Normally to check line failure contact you must turn off mains power. This is not necessary with this utility. 3 options are available. **SIMULATION OFF** simulation mode is off **SIM: LINE FAILURE** if you press ENTER key for 3 seconds, the line failure relay on the interface board is energized. **SIM: LIN.F+BT.LOW** if you press enter key for 3 seconds line failure and battery low relays are energized. **SIM: BYPASS** if you press ENTER key for 3 seconds bypass relay is energized. This way, you can check dry contact connections
7	**ENTER <EXIT>**	→ Enter **(↵)** exit from submenu
	Go to STATUS MENU	

Restricted

3.2.7 TIME Menu Items

You can see date and time of RTC (real time clock) on UPS. And you can adjust date and time.

	Submenu item	Function
1	**TIME : 23 :15**	time
2	**DATE : 11-10-2006**	date
3	**SET HOURS: 11**	(+) and (-) adjust hours (0-23)
4	**SET MINS : 38**	(+) and (-) adjust minutes (0-59)
5	**SET DAY : 21**	(+) and (-) adjust day (1-31)
6	**SET MONTH : 06**	(+) and (-) adjust month(1-12)
7	**SET YEAR : 2006**	(+) and (-) adjust year (2000-2099)
8	**ENTER <UPDATE>**	→ Enter update new date and time
9	**ENTER <EXIT>**	→ Enter **(↵)** exit from submenu
	Go to STATUS MENU	

3.2.8 SERVICE Menu Items:

	Submenu item	Function
1	**HOURMTR: 00027**	**Total operation time of the UPS**
2	**MAX.LOAD:095%**	**Recorded max. load**
3	**TO B. TEST: 008Hr**	**Time until next automatic battery test.**
4	**ENTER <EXIT>**	**→ Enter (↵) Exit from submenu**
	Go to STATUS MENU	

3.3 STATUS Messages

This message group simply shows the UPS STATUS on the upper line of LCD PANEL.

RECTIFIER START ! : UPS started the rectifier
INVERTER START ! : UPS started the inverter
MAINT SWITCH ON ! : Maintenance bypass switch is on
MANUEL BYPASS ! : Load is transferred to mains manually
STATUS ALARM ! : Alarm status
STATUS NORMAL ! : UPS is operating normally.
EMERGENCY STOP ! : External emergency signal is detected.
WAITING SYNC ! : Inverter started and waiting for synchronization
STATUS FAULT ! : Fault status
STATUS WARNING ! : Warning message is valid on LCD panel
CLOSE BATT.CB ! : UPS is waiting for battery CB to be closed
INV. OUT FAILURE! : The UPS gave four successive “INV. BALANCE” error.

RECTIFIER START :
At start up the UPS controller board checks for input voltage, frequency, battery voltage for starting, if these parameters are normal, it starts up.

INVERTER START :
If the inverter stops by any reason, controller board tries to restart the inverter. Each time the inverter is started, this message appears on the first line of LCD PANEL

MAINT SWITCH ON:
Maintenance bypass switch is connected from bypass input to the output of UPS directly .If the maintenance bypass switch is on (1 position) controller stops the inverter against any accidental short circuits between mains voltage and inverter output. If the user turns off the maintenance bypass switch, inverter starts again.

EMERGENCY STOP :
If an external EPO switch is installed to system (connected to interface board), it is possible to stop all UPS parts (rectifier, static bypass, inverter, etc….). After pressing EPO switch, the rectifier and inverter are turned off and the power to the critical load is turned off. To start again, turn off the ON/OFF switch and turn it on again.

Restricted

FAULT STATUS:
In some cases controller checks events but can not find solutions, in this case controller decide to stop the system. For restarting the user must turn off the ON/OFF switch and turn it on again.

WARNING STATUS:
Some events recorded to log event file stays on LCD PANEL but UPS continues to work, these messages named as warning messages, user can clear this messages by pressing ENTER key for 3 seconds.
These are:

- A20 Boost charge alert
- A6 Charge fault
- A18 Batt capacity low

3.4 Shutdown messages:

CL-300P series UPS can operate interactive with the operating system. You can send commands to UPS from operating system by using some softwares .UPS takes these commands and produces some messages listed below:

WAITING SHUTDOWN	:	Shutdown command is performed by the operating system and UPS is waiting for a certain delay for shutdown.
UPS SHUTDOWN	:	UPS is in shutdown status
WAITING RESTART	:	UPS is shutdown but it is waiting for a certain delay for restart
PAR.SHUTDOWN	:	In parallel systems the other UPS sends shutdown command and UPS is in shutdown status**.**
CANCEL SHUTDOWN	:	Shutdown command is cancelled.

Only operating system or a PC computer can send these commands.
If the shutdown command is performed during line failure UPS shutdowns and if the mains is okay UPS starts again automatically.

3.5 Fault Messages and Quick Troubleshooting :

All alarms contained in CL-300P UPS control software are listed in the following table.

ALARM	DESCRIPTION
A1 BYPASS FAILURE	Bypass system failure
Possible Causes:	Bypass components may be faulty, call service.
A2 INVERTER FAILURE	Inverter digital start system is failed
Possible Causes:	Internal failure. Call service.
A3 3 OVERTEMP	Overtemperature in UPS repeated 3 times in the last 30 mins.
Possible Causes:	1) Check for UPS air inlets and outlets for any blocking by dust etc. 2) Fan failure 3) Bad UPS location 4) Check for Overload
A4 OUT FAILURE	UPS output voltage is out of tolerance for 3 times in the last 30 mins. Internal failure. Call service.
A5 BATT AUT END	Batteries are completely discharged; wait for restoration of electric power input. This message occurs only at the end of a battery operation during line failure.
A6 CHARGER FAULT	Rectifier could not produce DC bus voltage.
A7 BATTERY LOW	Battery voltage is low. (either positive or negative)
Possible Causes:	1) UPS operation for long time when line out 2) Charger system failure
A8 OUTPUT HIGH	Inverter output voltage is higher than the max. tolerated value. Inverter is stopped.
Possible Causes:	1) Inverter failure

Restricted

ALARM	DESCRIPTION
A9 OVERLOAD **Possible Causes:**	UPS loaded more than 100% of nominal power rating. This state is may be continous or temporary. When this alarm is continous check the loads connected to the UPS output.
A10 LINE FAILURE **Possible Causes:**	Line failure. 1) Mains may be off. 2) Check all three input phases. 3) Check UPS input fuses.
A11 HIGH TEMPER	Overtemperature 1) Overload for inverter 2) Excessive ambient temperature. 3) Fan failure or dirty air inlets 4) Bad UPS location (not enough ventilation)
A12 OVERCURRENT	Inverter output system failure 1) Internal overcurrent 2) Output short circuit. 3) UPS failure. Call the service.
A13 OUTPUT LOW	Inverter output voltage is lower than the min tolerated value. Inverter is stopped.
A14 BATTERY HIGH	Battery voltage is higher than max. tolerated value for batteries. (either positive or negative battery groups)
A15 FUSE FAILURE	Blown fuse(s). (not used in this power range)
A16 BYP INPUT BAD	During transfer to bypass, Voltage or frequency value of bypass source is incorrect and the UPS turns off the load power. During normal (inverter) operation some times you can see this message due to fluctuations in bypass supply. During bypass if the bypass protection option is “ON” and if the bypass source is out of tolerance UPS switches off the static bypass for load protection.
A17 BATT CB OPEN	Battery circuit breaker is off ,batteries are not connected to UPS At start up If the mains is okay you can start operation having this message active. At start up during line failure UPS waits for the battery CB to be turned on and then starts.
A18 BATT.CAPA.LOW	If the battery charge level is low this message indicates that charge period is not completed yet. If mains failure occurs during this message, battery operation time may be unexpectedly short. UPS gives beep sound every 15 sec
A19 BATT FAULT **Possible Causes:**	Battery test aborted. And batteries are not OKAY UPS gives beep sound every 15 sec You can clear this message by pressing the ENTER key for 3 seconds. 1) Rectifier fault 2) Damaged battery cells 3) Poor battery connections
A20 BOOST CHARGE	Boost charge is active. At the end of the boost charging time UPS stops the boost charge. UPS gives beep sound every 15 sec
A23 MODE FAILURE	In parallel system, the operation mode of the UPS is different from the others.
A24 P.FAILURE 17	Parallel controller board failure
A25 P.FAILURE 18	Parallel controller board failure
A26 P.FAILURE 19	Parallel controller board failure
A27 P.FAILURE 20	Parallel controller board failure

Restricted

ALARM	DESCRIPTION
A28 P.FAILURE 21	Parallel controller board failure
A29 P.TEST MODE	Parallel controller is in test mode
A30 P FAILURE 23	Parallel controller board failure
A31 DUBL UPS NR. **Possible Causes:**	Same UPS number is used for two UPS in the parallel system. 1) Change number(s) in OPTIONS Menu.
A39 PSP FAILURE1	Control Power supply fault.
A40 CANT FIND PR	One of parallel modes is selected but there is no parallel control board on UPS Change mode from OPTIONS Menu.
A41 P.BAL.FAILURE	In parallel operation current sharing is not okay
A42 BATTERY TEST	Performing battery test
A43 P.SYNC.FAIL	In parallel system SLAVE UPS is not synchronized to MASTER UPS
A44 BT.OPERATION **Possible Causes:**	UPS is operating on batteries 1) AC line voltage is not available or out of tolerated voltage limits. 2) Distribution problems or blown fuse(s)
A45 MAINS OK	After mains failure, mains voltage restored again. This message appears on screen for 15 seconds after mains restoration.
A46 BOOST CH.END	Boost charging period has been completed, normal float charging conditions are valid.
A47 CANNOT START	Inverter can not start because of an internal fault.
A52 MANUA. BYPASS	Load transferred to bypass supply from COMMAND MENU
A64 INV. BALANCE	DC balance problem at the Inverter output. Call service.
A65 MAINS HIGH	AC Input Voltage above the tolerated value

Additional Alarm codes for Parallel Operation (Optional).

ALARM	DESCRIPTION
P05 P.SYNC. ALARM	In parallel system SLAVE UPS is not synchronized to MASTER UPS
P07 P.BAL. ALARM	In parallel operation current sharing is not okay (temporary)
P10 P.CLK ALARM	There is an interruption or false status on parallel synchron signal between 2 UPS (temporary)
P16 MODE FAILURE	SLAVE ups search for the same operating mode with MASTER ups, if they are different this message is seen on LCD panel. Change the operation mode of SLAVE ups from OPTIONS MENU. Don't forget to press ENTER key for 3 seconds Turn off the SLAVE ups and turn on again.
P17 RS485 ALARM	There is an interruption or false status in parallel communication between the UPSs
P19 DATA CABLE	Data connection cable between parallel UPS is not OK (bad connection or cable mismatch)
P20 ONLY ONLINE	There is an online UPS in parallel system, please change the operation mode
P21 PLUG IN DIG.	The digital connection cable between parallel UPSs is unplugged
P23 PSP FAILURE 2	Parallel controller board isolated power supply is out
P24 DUBL UPS NR.	Same UPS number is used in parallel system. Change from OPTIONS MENU
P25 NO CLOCK	During power up the synchron clock signal is lost by slave UPS

Restricted

IV. PARALLEL OPERATION

4.1 Introduction

Two (or more) identical CL-300P series UPSs can be interconnected for parallel operation. The main purposes for parallel use of CL-300P series UPSs are:

-Redundancy for Increased Reliability
-Power Increase

Although recent UPS designs are perfect and have high MTBF figures, a second (or more) UPS can be used in parallel with the first one, for supplying the critical load in case of any possible failure of the first UPS. In such an application the faulty UPS is isolated automatically from the parallel system and the other UPS (or UPSs) continues to supply the critical load. Use of Redundant UPSs in parallel, therefore, provides increased reliability for the critical load connected to the parallel system output.

If power demand increases in a certain UPS appliction exceeding the power rating of an already installed stand-alone UPS, a second (or more) UPS of the same model and power rating can be added in parallel to the existing UPS to increase the output power capacity.

Schematic diagram of parallel connection of two CL-300P series UPS units is shown in Figure 4.1

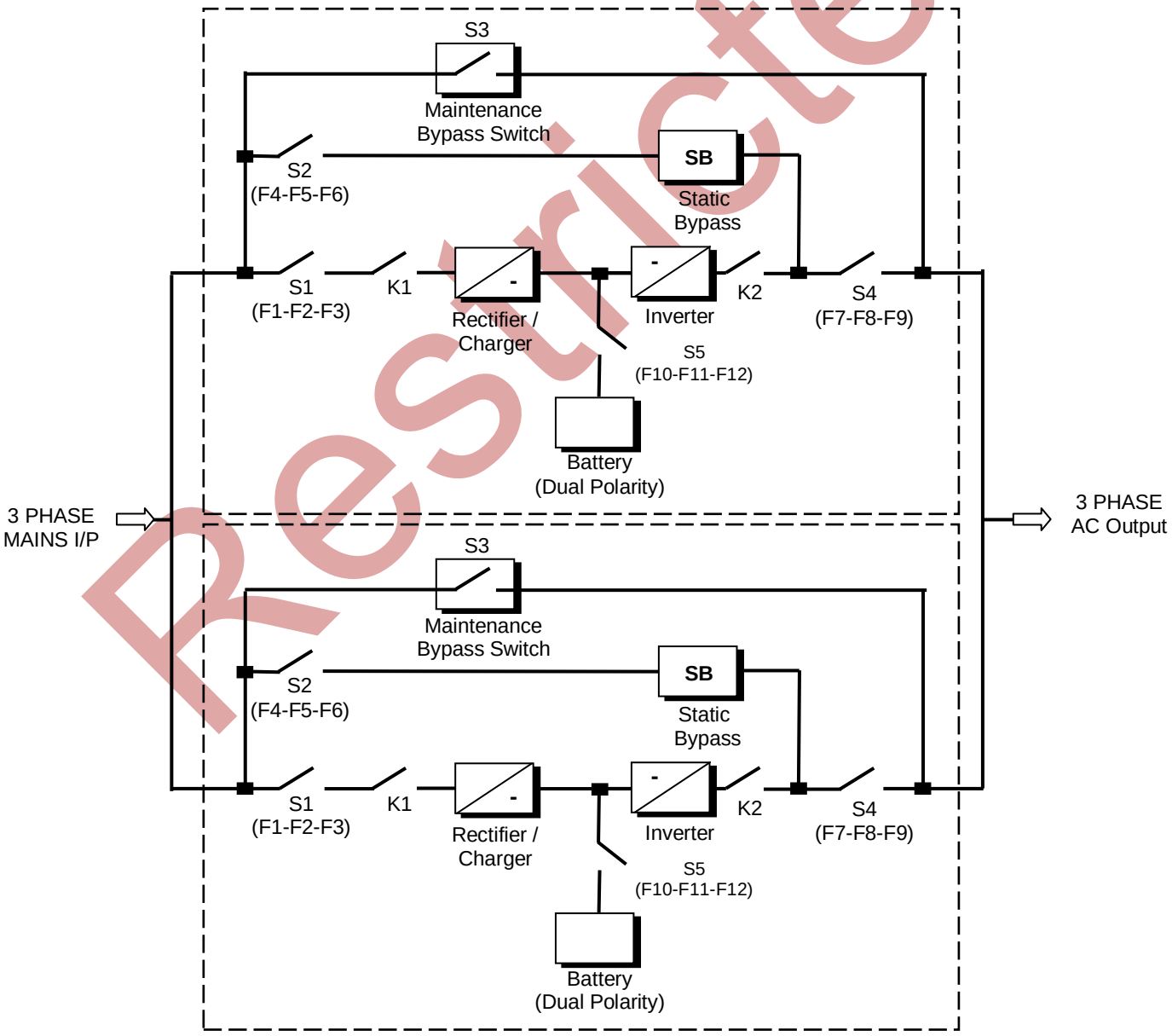

Figure 4.1 Parallel Connection of two UPSs

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The AC inputs of all UPSs in the parallel system are connected to the same mains, and all the AC outputs are connected to each other. Each UPS has its own battery group. The critical load is connected to the common output of the parallel system. There are also some signal cable connections between the UPS units necessary for parallel operation, and will be described later.

4.2 Parallel Operation Modes of CL-300P Series UPSs

NOTE: Parallel operation hardware (parallel controller boards and some other accessories) are not installed in a standard CL-300P series UPS, but parallel operation option is available and can easily be added to all UPSs.

Parallel operation is possible in one of the three modes:

1) PARALLEL operation (power increase)
2) REDUNDANT parallel operation
3) N+1 REDUNDANT parallel operation

NOTES:

1- The preferred mode for parallel operation can be selected using OPTIONS MENU.
2- For parallel operation, each UPS must be assigned a unique UPS No again using OPTIONS MENU.

4.2.1. PARALLEL mode

This mode should be selected for increasing the available UPS power capacity. **If this mode is selected for parallel UPS operation, the total VA rating of the parallel system is the sum of the VA ratings of all the UPSs connected in parallel.** The output load is equally shared by each UPS in the parallel system. Mains power is used as the spare energy supply (BYPASS).

In case of a failure in one of the UPSs, the Static Bypass Switches of all UPSs are turned on and the load is transferred totally to the spare energy supply (usually mains voltage) without any interruption. If the fault is cleared and if everything returns to normal operating conditions, the Inverters of all UPSs in the parallel system resume the load together at the same time.
The output load of the parallel system is shared equally by each UPS, both during Inverter or Bypass operation.

If this mode is active, you will see ‘’PARALLEL MODE/MS’’ on the LCD panel of one of the UPSs, and you will see ‘’PARALLEL MODE/SL’’ on the LCD panels of all the other UPSs connected in the parallel system (MS meaning Master and SL meaning Slave).

In PARALLEL mode, the Static Bypass Switches of all the UPSs in the parallel system act (turns on or off) simultaneously. During normal PARALLEL operation, the load is shared equally by the inverter outputs of each UPS provided that the output switches of all UPS units are turned on. In case of a failure in one of the UPS units or if the output switch of one of the units is turned off, the static bypass switches of all the parallel units are turned on simultaneously and the critical load is transferred to the bypass supply without any interruption.

In other words, during operation in PARALLEL mode, the parallel UPS system behaves like a single (stand-alone) UPS with a higher power rating.

4.2.2. REDUNDANT mode

This mode is used for operation of two (or more) UPS units connected in parallel, for increased reliability. If this mode is selected, the load is shared equally by each UPS available in the parallel system, during normal operation.

In case of failure of one (or more) of the UPSs, the faulty UPS is isolated from the parallel system and the critical load is still supplied by the remaining UPSs. If the faulty UPS returns to normal operation , it joins the parallel system again and starts sharing the load.

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In REDUNDANT parallel mode, the total VA rating of the parallel system is equal to the VA rating of a single UPS used in the system. Only after all the UPS units in the system fail and are isolated from the system, the critical load is transferred to Bypass supply without interruption.

If this mode is active, you will see ‘’REDUNDT. MODE/MS’’ on the LCD panel of one of the UPS units, and you will see ‘’REDUNDT. MODE/SL’’ on the LCD panels of all the other UPS units connected in the parallel system.

As explained above, higher degree of reliability for supplying a critical load can be obtained by choosing REDUNDANT mode for parallel operation and using as many as possible parallel connected UPSs.

4.2.3. N+1 REDUNDANT mode

This mode is used for operation of at least three (2+1 configuration) UPS units connected in parallel for increased reliability. If this mode is selected, the load is shared equally by each UPS available in the parallel system (N+1 numbers of UPS units), during normal operation.

In case of a failure of any one of the UPS units, the faulty UPS is isolated from the parallel system and the critical load is supplied by the remaining N number of UPSs. If any one of those UPS units fails too, then the critical load is transferred to bypass supply via the static bypass switches of the parallel connected UPSs. If the faulty UPS returns to normal operation, it joins the parallel system again and starts sharing the load.

In N+1 REDUNDANT parallel mode, the total VA rating of the parallel system is equal to the VA rating of a single UPS multiplied by N.

If this mode is active, you will see ‘’N+1 REDUNDANT/MS’’ on the LCD panel of one of the UPS units, and you will see ‘’N+1 REDUNDANT/SL’’ on the LCD panels of all the other UPS units connected in the parallel system.

More detailed diagrams for two (or more) CL-300P series UPSs connected in parallel are given in Figures 4.2 and 4.3

Figure 4.2 CL300P Series Parallel UPS Signal Cable Connections

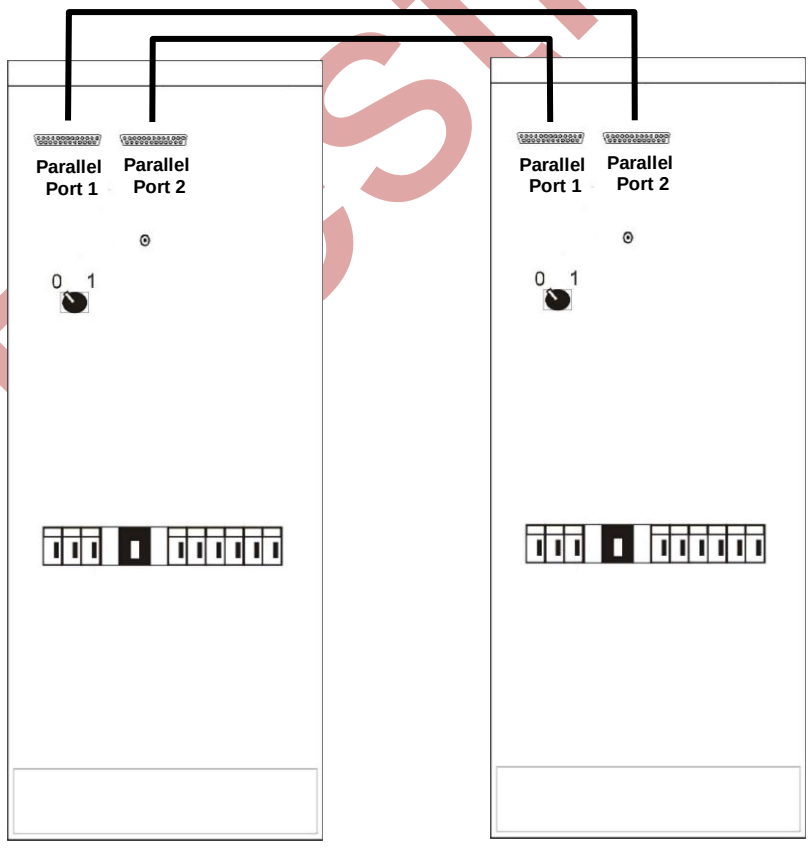

Figure 4.2.a 2 units in parallel if port2 jumper is not shorted

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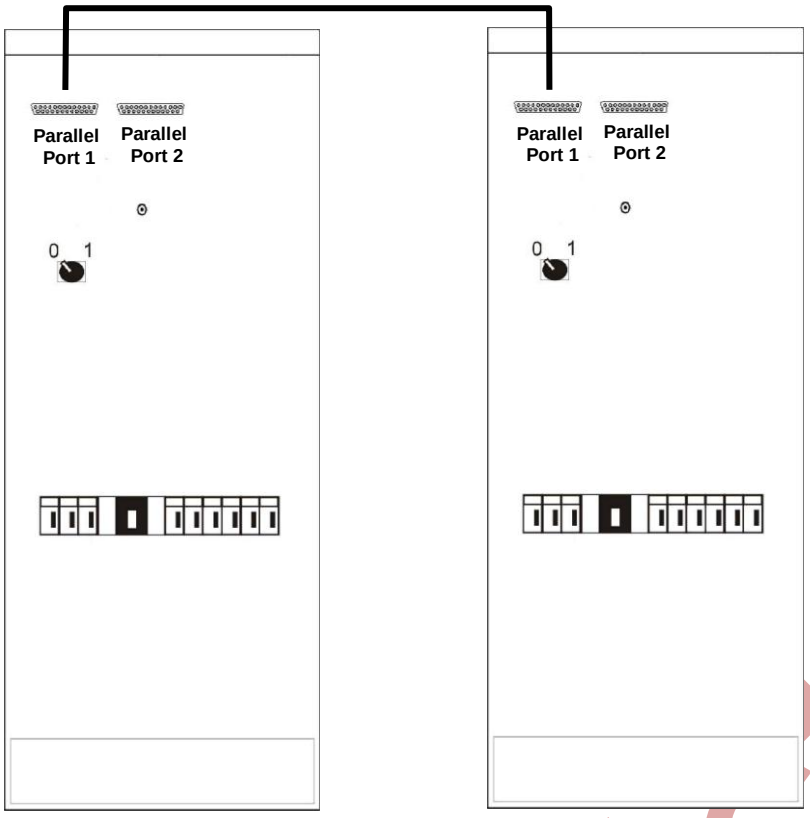

Figure 4.2.b

2 units in parallel if port2 jumper is connected (shorted)

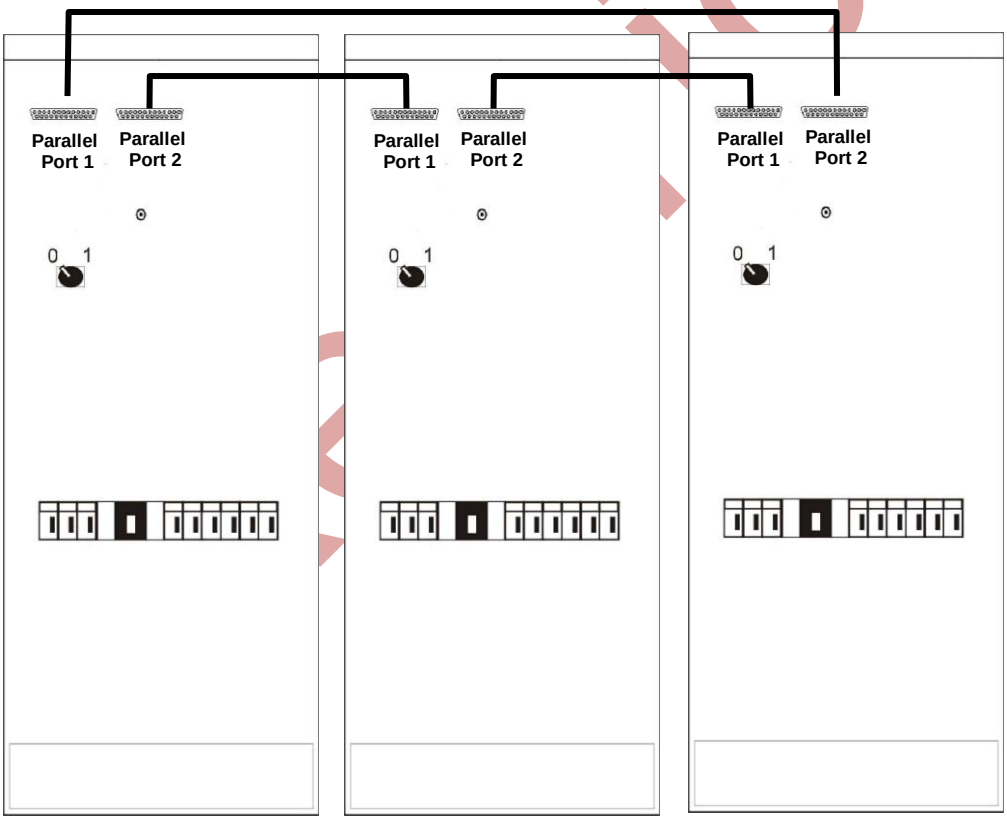

Figure 4.2.c

3 units in parallel

Note: One purpose-built signal cable (DB25) is provided for each UPS unit in the parallel system. Parallel signal cables are interconnected between the UPS units to form a loop, as shown in figure 4.2, for having higher reliability against any possible signal cable failures.
After completing the parallel connection of all the UPS units as shown in Figures 4.2 and 4.3, turn on each UPS unit one by one and select the operation mode and assign a UPS No, using OPTIONS MENU.

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All the units must be set for the **same operation mode** and must have a **different UPS number.**

CAUTION !!! **You must never set the operation modes of parallel connected UPS units to "ONLINE", otherwise serious damage may occur in UPSs.**

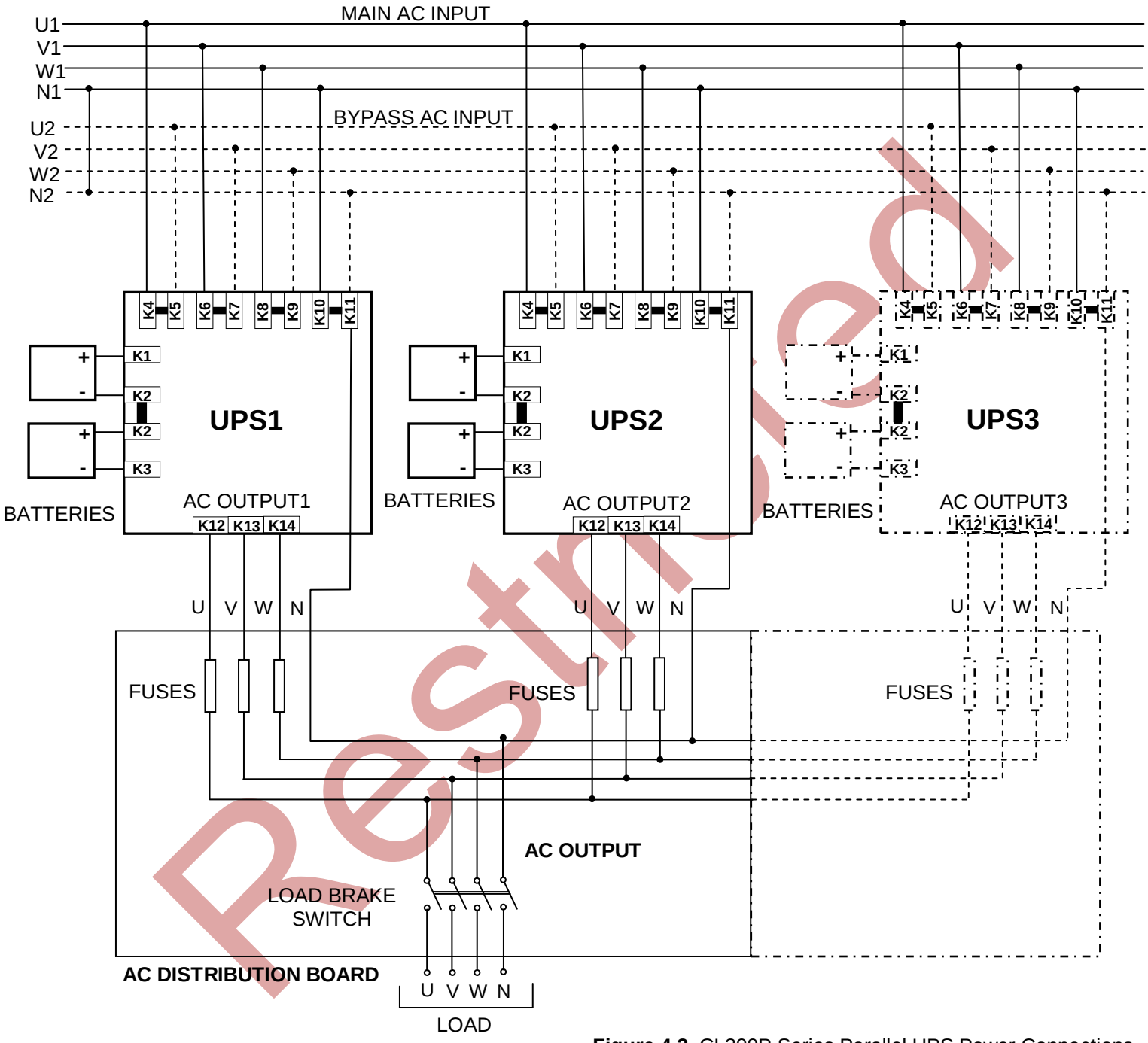

Figure 4.3 CL300P Series Parallel UPS Power Connections

Note: As seen in the figure, the outputs of parallel UPS units should be connected to each other using an AC distribution board.

ATTENTION!!! The cables from each UPS output to the distribution board must be of the same size and length for proper load sharing during parallel operation.

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V. OPERATING INSTRUCTIONS

5.1 INTRODUCTION

After completing the installation of the unit, and connecting all the power cables with all switches and fuses in “OFF” position,

1. Check the battery polarities.
   K1 : + V (+360V Nominal, +405V under float charge)
   K2 - K2 : 0 Volts (connected to the midpoint of the 60 blocks battery string)
   K3 : - V (-360V Nominal, -405V under float charge)
2. Check the 3 phase AC input and neutral connections. (Phase sequence is important)

NOTE THAT SEPARATE CABLES FROM EACH BATTERY GROUP SHOULD BE CONNECTED TO K2 TERMINALS TO FORM THE MIDPOINT CONNECTION!

WARNING!!! The UPS must never be turned on without input neutral connection.

3. Check the output (load) connections.

5.2 OPERATING INSTRUCTIONS FOR A SINGLE UPS UNIT. (ONLINE OPERATION)

5.2.1 Procedure For Turning On The UPS To Supply The Load From A Complete Power-Off Condition

1. Turn on S1 (AC Input)
2. Turn on S2 (Bypass)
3. Turn on S4 (AC Output)

ATTENTION!!! AS SOON AS YOU TURN ON ON/OFF SWITCH (S7), BYPASS VOLTAGE WILL APPEAR ON THE OUTPUT TERMINALS.

4. Turn on S7 (ON/OFF Switch), LCD panel will start running. “RECTIFIER START” message will appear on the front panel.
5. When “INVERTER START“appears on the front panel turn on S5 (Battery) into “1” position.

After a few seconds, the BYPASS led L4 (red) will turn off and the INVERTER led L6 (green) will turn on. The UPS is ready for uninterrupted operation when “STATUS NORMAL/ONLINE MODE” message appears on the front panel.

5.2.2 Power Off

After turning off all the loads connected to UPS output:

1. Turn off S4 (AC Output) into “0” position.
2. Turn off S7 (ON/OFF Switch) into “0” position.
3. Turn off S5 (Battery) into “0” position.
4. Turn off S2 (Bypass) into “0” position.
5. Turn off S1 (AC Input) into “0” position.

This is a complete power off condition and both RECTIFIER and INVERTER are not operating in this case.

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5.2.3 Switching into Maintenance Bypass Mode

1. Use “DOWN” button to choose COMMAND MENU and press ENTER. Use “DOWN” button again to reach ENTER <BYPASS> message. Press ENTER, the UPS will switch into bypass mode. “MANUAL BYPASS” and “A52 MANUA. BYPASS” messages will appear on the screen.
2. Remove the padlock on S3 (Maintenance Bypass Switch) and turn it on into “1” position.
3. Turn off S7, S5, S1, S2 and S4.

   Now there is bypass voltage directly on the load, note that there is no AC or DC power in the UPS for maintenance and servicing purposes.

5.2.4 Switching From Maintenance Bypass Into Normal Operation

1. Turn on S1 (AC Input)
2. Turn on S2 (Bypass)
3. Turn on S4 (AC Output)
4. Turn on S7 (ON/OFF Switch), LCD panel will start running. “RECTIFIER START” message will appear on the front panel. After the rectifier is started, the inverter will not start and the message MAINT. SW. ON will be seen on the panel instead of INVERTER START.
5. Turn off S3 (Maintenance Bypass Switch) and lock again. The inverter will start automatically.
6. Turn on S5 (Battery).

Now, the UPS is ready for normal operation.

5.3 OPERATING INSTRUCTIONS FOR PARALLEL CONNECTED UPSs.

Procedure For Turning on the UPS (First Installation)

With all the switches (S1, S2, S3, S4 and S5) in “OFF” (“0”) position and with S6 (static bypass switch) in “NORMAL” position.

Note: S6 is the Manual Bypass Switch used in parallel connected UPSs. In parallel UPSs, the “ENTER <BYPASS>” item in the COMMAND menu is disabled and static bypass function is controlled by S6.

Turn on the parallel connected UPS units as follows:

1. Make sure that all signal and power connections have been completed properly according to the diagrams and instructions given before.
2. Turn on S1 (AC Input)
3. Turn on S2 (Bypass)

ATTENTION!!! NEVER TURN ON S4 (AC Output) BEFORE COMPLETING MODE SELECTION PROCEDURE FOR ALL UPS UNITS.

4. Turn on S7 (ON/OFF switch) LCD panel starts running and following messages appears on the panel.

   - “RECTIFIER START”
   - “INVERTER START”

5. Using UP-DOWN keys on the front panel, select “OPTIONS MENU” on LCD and press “ENTER”.

   When you see MODE:_display, select one of the following parallel operation modes suitable for your application, using “+” and “-“ keys.

   - PARALLEL
   - N+1 REDUNDANT
   - REDUNDANT

   After selecting one of the parallel modes, press “ENTER”

6. Again using UP-DOWN and “+”, “-“ keys in the OPTIONS MENU enter a number (0 to 3) for each UPS.

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7. Turn off S7 (ON-OFF) and after a few seconds turn it on again. UPS wilt start running again.
8. When “INVERTER START” message appears on the front panel turn on S5 (Battery) into “1”.

   Perform the same procedure given above for all UPS units. **Make sure that all the units have the same operating mode but different UPS numbers.**
9. Turn on S4 (AC Output) switches of all UPSs one by one. Now the parallel UPS system is ready to supply the critical load.

5.3.2 Power Off

After turning off all the loads connected to the Parallel UPS System output, apply the following procedure **to all the UPS units** in the parallel system.

1. Turn off S4 (AC Output) into “0” position.
2. Turn off S7 (ON/OFF Switch) into “0” position.
3. Turn off S5 (Battery) into “0” position.
4. Turn off S2 (Bypass) into “0” position.
5. Turn off S1 (AC Input) into “0” position.

This is a complete power off condition and both RECTIFIER and INVERTER are not operating in this case.

5.3.3 Switching the Parallel UPS System into Maintenance Bypass Mode (uninterrupted transfer)

1. Switch S6 (static bypass switch for parallel UPSs) of either one of the UPS units into “STATIC BYPASS” position.
2. See that the red-coloured by-pass LEDs (L4) on the front panels of all UPSs are turned on. (Static Bypass Operation)
3. Turn on S3 switches (maintenance bypass) of all UPSs in the parallel system.
4. Turn off S4 switches (AC Output) of all UPS units.
5. Turn off S1 (AC Input) and S2 (Bypass) switches of all UPSs.
6. Turn off S5 (Battery) switches off all the UPS units in the parallel system.

Now all the UPS units which are connected in parallel are completely turned off and the load is supplied by the common Bypass supply via the Maintenance Bypass Switches of all the UPSs.

5.3.4 Switching the Parallel UPS system into Normal Operation From a Maintenance Bypass Power Down Condition. (uninterrupted transfer)

With the S6 switches (static bypass) of at least one of the UPSs, in “STATIC BYPASS” position, turn on all the units as follows:

1. Turn on S1 (AC Input) switches into “1” position.
2. Turn on S2 (Bypass) switches into “1” position.
3. Turn on S4 (AC Output) switches into “1” position.
4. Turn on S7 (ON-OFF) switches into “1” position.
5. When “MAINT SWITCH ON” message appears on LCD, turn off S3 (Maintenance bypass) switches of all UPSs.
6. Turn on S5 (Battery) into “1” position.
7. Bring S6 (static bypass) switches of all UPS units back to “NORMAL” position.

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VI. MAINTENANCE

WARNING!!! DO NOT OPEN the covers of the UPS because there are no user serviceable parts inside. DO NOT TOUCH battery leads. There is high voltage even if the UPS is off. Therefore no one should open the covers of the UPS except authorized service personnel. Otherwise, serious injuries may occur.

6.1 Scheduled Maintenance

Some semiconductor devices inside the UPS do not require any maintenance. Cooling fans are the only moving parts. If the environment is clean and cool enough, the scheduled maintenance requirements will be at minimum level. On the other hand, periodic checks and maintenance based on well prepared documents will increase the performance of the UPS and prevent some unimportant faults to become serious ones.
The equipment has been designed to require minimum maintenance effort. The user should follow the instructions below.

6.2 Daily checks

Check the UPS everyday and be careful about the following:

1. Check the operator control panel. Verify that all LEDs and parameter measurements are normal and there is no alarm message on the indicator panel.
2. Check if the device is overheated.
3. Check the cooling fans' operations.
4. Check if there is any sensible change in the noise level of the equipment.
5. Check if there is any stoppage on the ventilation path. If so, clean the dust using a vacuum cleaner.
6. Make sure that there is nothing placed on the UPS.

6.3 Weekly checks

1. Record the results on the indicator panel.
2. Measure and record voltages on each phase.
3. Measure and record currents on the output of the UPS.
4. Check batteries status by performing a manual battery test. Use a dry humid gland to clean the cover of the UPS.

Record the observations if possible. Check if there is any difference with the previous records (observations). If the last recorded values are significantly different from previous records, please check If the load has been changed, and if so please record the type, size, and position of this load. These information will be very valuable in helping the service personal in determining any possible errors.
If there is significant change in the parameter values without any reason please immediately call the qualified service personnel.

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6.4 Annual maintenance

To get reliable and efficient performance from the UPS, please call the qualified service personal at least once a year.

6.5 UPS Storage and transportation

1. Check the batteries charge by performing manual battery test before storage. If the charge is not enough then charge the batteries at least for 12 hours.
2. Qualified service personal should disconnect the electrical connections.
3. Batteries should be charged every six months during storage period.
4. Keep the UPS and batteries in dry and cool place.
   UPS ideal storage temp.: 0 ^{0}C ~ 40 ^{0}C max.
   Battery ideal storage temp.: 10 ^{0}C ~ 35 ^{0}C max.
5. The UPS must be placed on a suitable palette for transportation purposes.

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VII. FAULTS AND TROUBLESHOOTING

7.1 General Procedure For Fault Checking And Troubleshooting

UPS contains complicated electronic control circuits. In order to locate any fault occurring circuits, an advanced knowledge about the circuitry and its operation principles must be known. The aim of this section is to give the knowledge required at the first intervention.

There is no practical way to locate any possible fault. Most of the faults do not occur as a performance decrement. Generally, the UPS operates normally or switches into by-pass mode. But in order to determine any change in load or the system the parameters must be recorded regularly as mentioned previously.

Generally, the output voltage can deviate %2 from the predefined values. If values differ more than this percentage then reasons must be investigated.

The following general structure must be systematically followed while trying to indicate the error:

Fault determination: First step is to record the messages, indicator panel LEDs, operating parameter values and last status of switches. This must be done before

Fixing interventions: After recording all indications, check the meaning of the fault and alarm messages using “The operator control indicator panel”. If anything related, follow the related procedure.

Reporting the fault: Service personal must clearly report the work done. Hence, if any other error occurs there will be enough information to fix it.

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VIII. UPS REMOTE MONITORING AND CONTROL

Following external connections are available for CL-300P series UPSs.

- Communication by serial port connection.
- Dry contact (interface board) connections.
- Remote monitoring panel.

8.1 Using Serial Port

A standard Serial (RS232) communication port is installed to all CL-300P series UPS. By using this port user can get all information about the UPS. All measured parameters and alarms can be monitored via this port. This port is interactive and some commands for UPS operation are available. These commands are listed below.

- Switch to BYPASS
- Switch to INVERTER
- SOUND on/off
- Adjust UPS time and date
- Start SIMULATION mode
- Quick BATTERY TEST
- BATTERY TEST until battery low alarm
- CANCEL battery test
- Turn off UPS output voltage immediately (SHUTDOWN)
- Turn off UPS output voltage after delay (WAITING SHUTDOWN)
- Turn off UPS output voltage (SHUTDOWN) and turn on UPS output voltage (WAITING RESTART)
- CANCEL SHUTDOWN
- RENAME UPS

UPS will give response to these commands only if the **REMOTE: ENABLE** option is selected from **OPTIONS MENU.**

Apply your local distributor, for information on available software for monitoring and controlling the UPS.

Figure 8.

8.1.1 Communication Routing Switch:

RS232 Communication of the UPS can be routed either to an internal (e.g ML100 port multiplexer, MD1 MODBUS adapter, SNMP unit etc.) or to an external device.

There are two sets of DIP switch positions:

	1	2	3	4
INTERNAL (e.g. SNMP)	ON	OFF	ON	OFF
RS232 (EXTERNAL)	OFF	ON	OFF	ON

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In “RS232” position of DIP switches, RS232 communication with an external device is performed through the standard DB9 socket shown above. If DIP switches are in “INTERNAL” position, communication through the standard socket is turned off and routed to an internally connected device. For example, if an ML100 Port Multiplexer has been installed in the UPS, standard DB9 socket is not used for RS232 communication, instead, the two ports, COM1 and COM2 on the ML100 can be used for external communication simultaneously.

8.2 Serial Communication Cable

The maximum length for RS232 communication cable should be 25 meters. Cable connector pin configuration is as follows:

UPS side	PC side
9 Tx	2 Rx
7 Gnd	5 Gnd
6 Rx	3 Tx

For remote panel and UPS connection the same pin configuration is valid.

8.3 Modem Connection

A CL-300P Series UPS can be controlled through a normal telephone line by means of a remote operator connected through a PC with modem device, who performs a phone call to the UPS connected number. So the operator can see all parameters and control the UPS (if permitted from OPTIONS MENU).

8.3.1 Hardware Configuration

All requirements for modem connection are as follows:

- PC with modem
- WINDOWS 98
- Available UPS control software (T-MON)
- NULL modem which is connected to UPS

In order to perform this function a PC with UPS control software and an external or internal modem device connected to telephone line are needed.

A NULL modem device, configured according to NULL and auto answer modes, when installed in the UPS and, once programmed, following a telephone call of the PC-embedded modem, will connect the UPS to the telephone line.

8.3.2 Functioning Principle

The remote operator, by means of a PC and a modem device and using the remote connection function of the control software, calls the UPS through the number to which this is connected.
The NULL modem device, connected to the UPS, will answer the call and convert the data coming from UPS’s serial port on to the telephone line. This way all measurements and controls allowed by the RS232 serial port can be carried out.

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8.3.3 Modem programming procedure

Smart modem (SM) is the one connected to PC, and NULL Modem (NM) is the one connected to the UPS. Standard Hayes AT programming language is the suitable language for modems. In usual applications a modem which uses AT command set should be selected.

8.3.3.1 SMART Modem Programming (PC modem)

The connected modem to PC (smart modem) will be programmed from UPS control software (T-Mon) automatically.

B0 E1 F1 M1 Q0 V1 X3
BAUD = 2400 PARITY = N WORDLEN = 8
DIAL = TONE (TONE which can be programmed)

&A3 &B1 &C1 &D0 &H1 &I0 &K1 &M4
&N0 &R2 &S0 &T5 &Y1

8.3.4 Modem –UPS Connection Cable

The connection cable between NULL modem and UPS is configured as follows:

UPS DB9 female	MODEM DB25 male
6	3
7	7
9	2

8.4 Dry Contact (Interface) Connections

Some important events of the UPS can be monitored or controlled by these connections. There is a relay for each event, which is located on the interface board. The NC-C-N0 contacts of each Relay are available at the Interface Board output terminals.
These events are:

- LINE FAILURE
- BATTERY LOW
- LOAD ON BYPASS
- BATTERY CB input
- BATTERY CB output
- EMERGENCY STOP input

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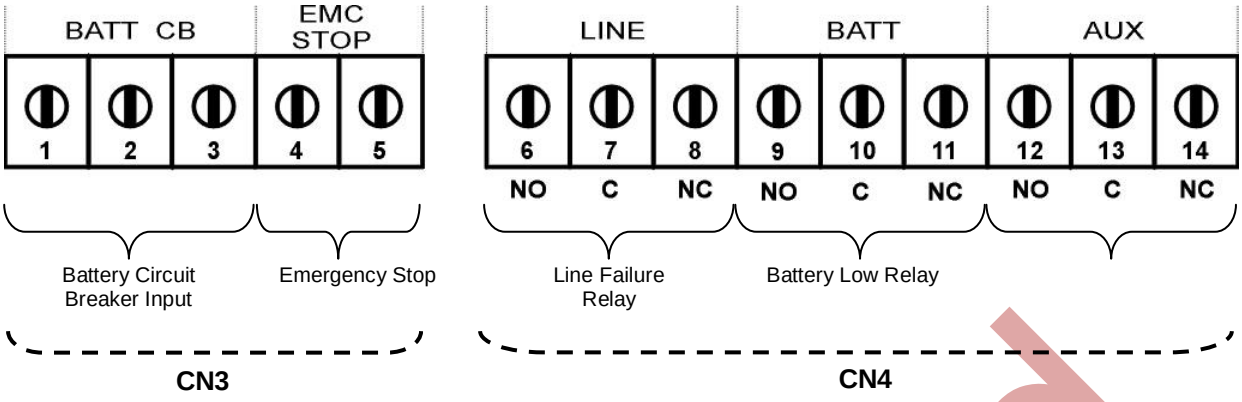

NOTE: Emergency stop terminals (4 and 5) should be short circuited by an external EPO switch to apply an EMERGENCY POWER OFF to the UPS (No output voltage).

Line Failure, Battery Low and Bypass relays are normally de-energized and they are energized only in case of an alarm. The behavior of these relays can be reversed by the user. (i.e. all relays are energized normally and de-energized in case of alarm)

8.5 Remote Monitoring Panel

Remote monitoring panel can be extended to 400 meters away from UPS. Up to 25 meters there is no need for extra hardware, and RS232 communication is okay. But if the distance is longer than 25 meters additional RS485 hardware is needed.

Up to 5 remote monitoring panels can be used in the system.

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Static Transfer Switch

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